Agreement No. CE 7/2005 (EP)
HATS – PROVISION OF DISINFECTION FACILITIES
AT STONECUTTERS ISLAND SEWAGE TREATMENT WORKS
ENVIRONMENTAL IMPACT ASSESSMENT
EXECUTIVE SUMMARY

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1 INTRODUCTION

Project Background

1.1 Stage 1 of the Harbour Area Treatment Scheme (HATS) has brought about substantial water quality improvements to the Victoria Harbour. However, it has also concentrated the discharge of 1.4 million m^3 per day of un-disinfected effluent from previously (pre-HATS Stage 1) dispersed sources along the coasts of Kowloon and eastern Hong Kong Island to a single point, i.e., the Stonecutters Island Sewage Treatment Works (SCISTW) outfall. Under the influence of prevailing tides and currents in the harbour, the net effect is increased *E. coli* levels at most of the bathing beaches along the Tsuen Wan coast. Together with water pollution caused by local sources such as sewage from upland unsewered villages or squatter areas, the un-disinfected effluent from SCISTW has exacerbated the already unsatisfactory beach water quality in Tsuen Wan.

1.2 Beach water pollution from local sources already resulted in the closure of Anglers', Approach and Ting Kau beaches before the commissioning of HATS Stage 1 in December 2001. After HATS Stage 1 was commissioned, beach water quality has deteriorated further. In 2003, the Government closed Lido, Casam, Hoi Mei Wan and Gemini beaches on the Tsuen Wan coast.

1.3 The purpose of the Project is to bring early water quality improvement to the Tsuen Wan beaches by disinfecting the SCISTW effluent to reduce *E. coli* to a level that would restore the beach water quality to pre-HATS Stage 1 conditions. Advance disinfection facilities (ADF) will be constructed within the existing sewage treatment works on Stonecutters Island (**Figure 1.1**), which is providing Chemically Enhanced Primary Treatment (CEPT). This would facilitate the re-opening of the affected beaches at the earliest opportunity.

1.4 On 22 July 2005, Maunsell Consultants Asia Ltd. was commissioned by the Drainage Services Department of the Hong Kong SAR Government to undertake the Environmental Impact Assessment (EIA) Study of the Project. The purpose of the EIA Study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and related activities that take place concurrently.

Need of the Project

1.5 Monitoring data from Environmental Protection Department show that both the HATS Stage 1 un-disinfected effluent discharge and local pollution sources are contributing to the "poor" and "very poor" beach water quality at the seven closed Tsuen Wan beaches (Angler's, Approach, Casam, Gemini, Hoi Mei Wan, Lido and Ting Kau). The ADF, together with reduction of localised un-treated wastewater discharges being implemented under the regional sewerage schemes, will be essential to improving the Tsuen Wan beach water quality and, consequently, re-opening of the beaches. Without this Project, the Tsuen Wan beach water quality cannot be restored even with the completion of local sewerage works, which can only arrest the local pollution problems, and would remain jeopardised by the un-disinfected HATS Stage 1 effluent, until the permanent disinfection facilities built under Stage 2A are commissioned by 2014.

1.6 This Project provides advance disinfection facilities to substantially reduce the *E. coli* contribution from the HATS effluent to the western waters and the Tsuen Wan beaches and will bring about necessary water quality improvements needed for the re-opening of Tsuen Wan beaches at the earliest possible moment. It is expected that the beach water quality after the operation of the ADF would be improved to a level that is better than the pre-HATS Stage 1 condition. The ADF, together with regional sewerage schemes to reduce local pollution, would improve the beach water quality and facilitate the re-opening of the beaches

in Tsuen Wan. This will be ascertained by monitoring of the actual beach water quality. Once the actual monitoring results confirm that the beach water quality has returned to an acceptable level for swimming, arrangements to re-open the beaches for public enjoyment will be instigated.

Consideration of Alternatives and Selection of Preferred Disinfection Technology

1.7 To achieve an optimal outcome, the choice of disinfection technology for HATS must take into account the following features, in combination, that are unique to the SCISTW:

- ***Mega-size***: SCISTW is a mega-sized facility serving several million people with an ultimate treatment capacity of around 2.5 million m^3 per day, among the largest in the world. This very large capacity and its pivotal role in marine water quality protection mean that any disinfection technology chosen must have proven reliability for application at mega scales.
- ***Phased Implementation of different treatment processes***: HATS Stage 2 would be implemented in two phases, with Stage 2A retaining the existing CEPT but with treatment capacity increased from 1.7 to 2.5 million m^3 per day. In Stage 2B, the treatment process would be upgraded to biological (secondary). CEPT and biologically treated effluents have different characteristics such as different concentrations of pathogens and suspended solids. The disinfection technology chosen must be flexible to suit varying effluent quantity and quality, and result in the least wastage to cope with the changed requirements for Stage 2B.
- ***Environmental setting of the SCISTW submarine outfall***: The setting of the marine environment around the SCISTW outfall leads to effective dilution and dispersion of the HATS effluent discharged into an area with rapid current and predominantly used for marine traffic and generally of low ecological value. Water sensitive receivers such as beaches, fish farms, coral sites and marine parks etc. are remote from the outfall site. Also, the receiving marine water facilitates die-off of infectious micro-organisms by virtue of natural environmental and biological factors including temperature, solar radiation and salinity etc.

1.8 With the above site-specific features in mind, a comprehensive four-tier option evaluation was conducted to select the most appropriate disinfection technology for HATS (and the ADF). The evaluation process consisted of long listing and short listing of technology options, along with multi-criteria assessment of environmental and non-environmental factors with increasing levels of sophistication. Local and international disinfection practices were also reviewed in parallel to provide the EIA team with general reference information.

1.9 Among the five groups of long listed disinfection technologies (chemically based, UV radiation, membrane, artificial reef and extension of the SCISTW outfall) subject to Tier 1 evaluation on feasibility in terms of functionality and proven-ness, only chlorination and UV radiation are feasible for application to mega-scale facilities like HATS. Some of the long listed technologies are feasible for small-scale operations, but none has been proven to be workable for facilities at HATS' scale. Chlorination/dechlorination and UV radiation were carried forward to the next tier of evaluation.

1.10 Tier 2 evaluation was to confirm the environmental acceptability of chlorination and UV radiation. Unless the EIA team was convinced by scientific evidence that the technology was environmentally acceptable for HATS, it would not be carried forward to the Tier 3 evaluation.

1.11 For chlorination/dechlorination, a number of investigations and assessments were carried out to determine whether this is an environmentally acceptable disinfection technology for HATS.

These included the following and the results are described in the EIA report.

- Laboratory experiments showing the formation of chlorination by-products (CBP) when chlorine was added to the CEPT effluent
- Laboratory testing on the concentrations of contaminants of potential concern (COPC) such as total residual chlorine (TRC) and CBP in CEPT effluent, chlorinated then dechlorinated CEPT effluent, secondary treated effluent, and chlorinated then dechlorinated secondary treated effluent.
- Bench scale tests to determine the optimal dosages for applying the chlorination and dechlorination chemicals
- Whole effluent toxicity tests (WETT) to determine the acute and chronic toxicity of CEPT effluent, chlorinated then dechlorinated CEPT effluent, secondary treated effluent, and chlorinated then dechlorinated secondary treated effluent to five representative local marine species.
- Hydrodynamic and water quality modelling
- Ecological risk assessment
- Human health risk assessment
- Hazard assessment

1.12 UV radiation is generally considered environmentally benign. Aldehydes and other oxidation by-products were found to exhibit a UV-dose response increase in previous pilot studies using both low- and high-intensity UV systems, but the elevated levels were found to be within the acceptable limits. Therefore, the risk on human health or ecological resources due to UV radiation of effluent is negligible.

1.13 The outcome of Tier 2 evaluation confirmed that both chlorination (with dechlorination) and UV radiation are environmentally acceptable disinfection options for HATS.

1.14 In Tier 3 evaluation, both options were further assessed against a comprehensive range of environmental criteria. For chlorination, purchasing sodium hypochlorite solution was determined to be the most appropriate means of chlorination for HATS, due to its flexibility in suiting varying effluent quantity and quality. For UV radiation, either low- or medium-pressure high intensity UV lamps would be suitable for application at SCISTW. These were assessed against nine environmental criteria including water quality, human health, marine ecology, fisheries, air quality, noise, landscape and visual, hazard to life and waste management implications. While both options would be environmentally acceptable for HATS, Tier 3 evaluation results showed that neither would be superior to the other on all of these environmental criteria considered.

1.15 Tier 4 evaluated four non-environmental criteria: cost, flexibility to cater for project risk and uncertainties, implementation issues and scale-up factor. The outcome showed that chlorination (with purchase of sodium hypochlorite) would be preferred over UV radiation for HATS due to:

- Chlorination being less costly than UV radiation on a total life cycle cost basis.
- Chlorination being more flexible than UV radiation to deal with project risks and uncertainties such as less sewage due to lower population growth and varying effluent quality. In particular, when the scale of disinfection is substantially reduced in Stage 2B due to better effluent quality, the chlorination option with the purchase of sodium hypochlorite would result in the least wastage should the disinfection technology at that time remain to be chlorination or be changed to other disinfection technology.
- Chlorination being quicker and easier than UV radiation to implement at SCISTW due to its relatively simple construction, thus realising environmental improvements to the Tsuen

Wan beaches earlier.

- Chlorination involves a smaller scale-up factor than UV radiation for disinfecting HATS CEPT effluent, hence a relatively more proven technology for disinfecting CEPT effluent under HATS ADF and Stage 2A.

2 PROJECT DESCRIPTION

Project Scope

2.1 The option of purchasing sodium hypochlorite solution for chlorination and sodium bisulphite for dechlorination was recommended as the preferred disinfection technology for HATS, with the following key facilities:

- Chlorination system - provision of a sodium hypochlorite solution storage area and associated dosing system, including
  - Six sodium hypochlorite storage tanks (4 duty, 2 standby, each 8m in diameter and 12.5m in height)
  - One day tank for sodium hypochlorite storage (capacity of about 100m3)
  - Pipes in pipe trenches
  - Switch room
  - Bund wall (2m in height)
  - ISO tank unloading area
  - Sodium hypochlorite barge unloading facility
- Dechlorination system - provision of a sodium bisulphite solution storage plant and associated dosing system, including
  - Two sodium bisulphite storage tanks (6m in diameter, 6.2m in height)
  - Chemical feeding and transfer room
  - Bund wall (1.5m in height)
  - ISO tank unloading area
  - Security fence and gate

2.2 The proposed chlorination system of the disinfection facilities would be located within the site boundary of the existing SCISTW (**Figure 1.1** refers). The proposed dechlorination plant would be located adjacent to the existing chamber no. 15 at the western end of Container Port Road South.

Project Programme

2.3 The works would be packaged under one contract that is tentatively scheduled to commence in March 2008 for completion in September 2009.

3 KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT

Air Quality

Construction Phase

3.1 Construction works would be small scale with limited number of dusty activities. There would be no adverse construction dust impact at the nearest representative air sensitive receivers (ASRs) with the implementation of dust suppression measures stipulated in the *Air Pollution Control (Construction Dust) Regulation* and good site practices. There would be no odour emission in the construction phase, as no temporary sewage treatment process/facility would be provided. Dust monitoring and audit are to be conducted during the construction phase to check on the efficacy of the control measures.

Operation Phase

3.2 The facilities in the chlorination/dechlorination plant are chemical storage vessels, chemical feed pumps, and dosing systems. As the sodium hypochlorite and sodium bisulphite would be stored in closed vessels, there would be no adverse air quality or odour impact on nearby ASRs during the operational phase. Environmental monitoring and audit during the operational phase would not be necessary.

Noise Impact

Construction Phase

3.3 Construction noise was predicted to range from 70 to 77 dB(A) at the barrack buildings and 62 to 70 dB(A) at the planned Fire Services Department (FSD) Diving Training Centre. The noise level at the barrack buildings would exceed the daytime construction noise criterion of 75 dB(A) during site formation, excavation & backfilling, erection of formwork and fabrication of steelwork.

3.4 With quiet powered mechanical equipment (PME) and good site practices, construction noise at the barrack buildings would drop to 62 to 73 dB(A), in compliance with the day time construction noise criterion. Although construction noise at the planned FSD Diving Training Centre was predicted to comply with the daytime construction noise criterion throughout the construction period, the use of quiet PME would still be recommended during the construction of the chlorination plant and day tank to minimize noise nuisance.

Operation Phase

3.5 With the proper designs of chlorination plant, day tank and dechlorination plant, operational noise at the barrack buildings and the planned FSD Diving Training Centre was predicted to comply with relevant daytime and night-time noise criteria.

Water Quality

Construction Phase

3.6 Land-based construction activities would have minor water quality impacts from surface runoff and sewage generated by on-site construction workers. Impacts could be controlled to comply with the Water Pollution Control Ordinance (WPCO) standards by implementing the recommended mitigation measures, resulting in acceptable residual impacts.

Operation Phase

3.7 The Delft3D model was used to assess water quality impacts during operation. The model results indicated that disinfection facilities are needed at SCISTW if the water quality at the Tsuen Wan beaches were to be returned to pre-HATS Stage 1 *E. coli* conditions.

3.8 The Project would reduce *E. coli* levels at the beaches and secondary contact recreation subzones along the Tsuen Wan coast and the seawater intakes in western Victoria Harbour. The model also predicted that *E. coli* levels in the Western Buffer water control zone (WCZ), western Victoria Harbour and eastern part of the North Western WCZ would be reduced upon commissioning of the Project.

3.9 Chlorination would generate total residual chlorine (TRC) and chlorination by-products (CBPs) in the effluent. Dechlorination would eliminate the discharge of TRC into the marine environment. As for CBPs, laboratory tests were carried out on 34 CBP's (including trihalomethane (THM) and haloacetic acid (HAA)) in the CEPT effluent before and after chlorination/dechlorination. Of these 34 CBP's, only 8 were detected in the CEPT after chlorination and dechlorination, the concentrations of 6 were less than 10 parts per billion while those for the remaining 2 were in the 10-50 parts per billion range. However, 5 of these 8 CBPs were also detected in the raw CEPT effluent before chlorination and dechlorination. Of these 5, the concentrations of 3 were less than 10 parts per billion while the remaining two had concentrations in the 10-50 parts per billion range. These results indicated that of the few CBP's detected, the majority was already present in the raw CEPT effluent, and the chlorination and dechlorination process introduced 3 CBP's all showing concentrations of less than 10 parts per billion. The laboratory results also showed that the THM and HAA formed were in the parts per billion concentration range, well below USEPA's drinking water standard for THM and HAA.

3.10 Water quality modelling results showed that the discharge of effluent after chlorination and dechlorination would not cause adverse water quality impact. Although the model input parameters were conservative, water quality modelling results suggested that the maximum TRC and CBPs levels in the receiving waters would comply well with the assessment criteria during normal operation of the SCISTW after commissioning of the Project.

3.11 Sensitivity model runs were performed to estimate the optimum disinfection levels and durations for the disinfection facilities, on one hand, to safeguard the beneficial uses of nearby water sensitive receivers and, on the other hand, to minimize the chlorine dose and thus the potential formation of CBPs. The model results suggested that year round disinfection would be needed to protect the Tsuen Wan gazetted beaches if these beaches are to be opened at all times. Year round disinfection would also be needed to protect the beneficial use of the Water Supplies Department (WSD) flushing water intakes in western Victoria Harbour. Based on the water quality modelling results, discharge standards are recommended for the HATS effluent after the Project commissioned as shown in **Table 3.1**.

Table 3.1 Recommended HATS Effluent Standards

Stage	***E. coli* (no. per 100 ml)**		**TRC (mg/l)**	
	Geometric Mean	**95 Percentile**	**95 Percentile**	**Maximum**
HATS – ADF Stage	200,000	3,000,000	0.2	0.4
HATS – Stage 2A	20,000	300,000	0.2	0.4

3.12 Regarding Stage 2B, the EIA water quality modelling results showed that with the implementation of biological treatment, compliance with the relevant WQO at most of the beaches without the provision of disinfection should be achievable. However, it is important to note that modelling cannot fully predict the high variability of some factors (e.g. salinity, natural ultra violet radiation, and wind) that affect the density of E. coli in the receiving waters. Therefore, planning for disinfection in Stage 2B is recommended, though this provision may be reviewed in the light of actual water quality monitoring results after commissioning of the ADF.

3.13 If the dechlorination plant fails, the chlorination process could be practically stopped within 30 minutes to avoid excessive discharge of TRC into the marine waters. Model results indicated that no unacceptable TRC impact would occur at all the identified water and ecological sensitive receivers under the emergencies. Failure of dechlorination could be caused by the malfunction of the pumping system or power failure at the dechlorination unit. The plant operator would be notified immediately after any pump failure or power failure via the alarm of the control system at the SCISTW. In case of pump failure, standby pumping system should be switched on automatically or by the operator at the control system. In case of power outage, the uninterruptible power supply (UPS) system will switch the power supply of the sodium bisulphite dosing pump to a backup battery immediately, allowing continuous dosage of sodium bisulphite for at least half an hour so that sufficient time can be provided for shutting down the chlorination plant to avoid the possibility of discharge of chlorinated effluent. With proper implementation of these precautionary design measures, dechlorination plant failure would be remote.

3.14 The model predicted that the emergency release of un-disinfected effluent would result in short-term elevation of *E. coli* levels at the gazetted beaches in Tsuen Wan District, the Ma Wan fish culture zone (FCZ) and the WSD flushing water intakes in western Victoria Harbour. Implementation of the recommended precautionary design measures, including the provision of dual power supply, standby pumps and equipment, would avoid the occurrence of emergency discharge. In the remote case that it occurs, the operator of SCISTW should closely communicate with the Environmental Protection Department (EPD) and Leisure and Cultural Services Department (LCSD) to take appropriate actions on closing the beaches and secondary contact zones in the coastal area of Tsuen Wan if situation warrants. Water quality monitoring is recommended at such a time to quantify the impacts and to determine when the normal water quality conditions are restored. No insurmountable water quality impact is expected from these temporary discharges under emergency.

Human Health and Ecological Risk Assessment

3.15 Risk assessments were conducted to assess the potential adverse human health and ecological effects that may result from exposure to toxic substances from the HATS effluent discharge. The findings can be summarized in three categories: risk to human health, risk to aquatic life and risk to marine mammals.

Risk to Human Health

3.16 Results of Human Health Risk Assessment revealed that potential risk/hazard impact due to CBPs present in the chlorinated/dechlorinated HATS effluent would be negligible and acceptable under established assessment criteria in all Project Scenarios. Cumulative risk assessment indicated that the potential risk/hazard impact due to CBPs and other pollutants present in the chlorinated / dechlorinated (C/D) HATS effluent would also be low and acceptable under established assessment criteria in all Project Scenarios.

Risk to Aquatic Life

3.17 According to the findings of Ecological Risk Assessment – Aquatic Life, the potential risk to aquatic life due to CBPs present in C/D HATS effluent would be lower than the risk screening value. Since the calculated risk is below the screening value, it would indicate that the Project does not present an unacceptable risk and no further investigation would be required. For cumulative risk assessment, which included both CBPs and other pollutants present in the C/D HATS effluent, the results showed a potential hazard impact similar to that of the un-chlorinated effluent, indicating that the chlorination process would not cause significant additional toxicity to the effluent.

3.18 Results of whole effluent toxicity test on C/D effluent were used to supplement the ecological risk assessment and to determine whether the C/D effluent would induce adverse effects to aquatic life. It was found that the established toxicity criteria were complied at both edge of zone of initial dilution (ZID) and edge of mixing zone in all Project Scenarios. Therefore, the potential risks due to C/D effluent imposed to aquatic life were expected to be minimal and acceptable.

Risk to Marine Mammals

3.19 Results of Ecological Risk Assessment – Marine Mammals, the potential risk to marine mammals due to CBPs present in C/D HATS effluent would be lower than the risk screening value. Since the calculated risk is below the screening value, it would indicate that the Project does not present an unacceptable risk and no further investigation would be required. Cumulative risk assessment revealed that CBPs and other pollutants present in the C/D HATS effluent would also be negligible and acceptable in all Project Scenarios.

3.20 According to the risk assessment results, the Project would not cause unacceptable risk to human health and ecological resources. Therefore, the Project was considered to be environmentally acceptable in terms of risks/impacts to human health and marine ecological resources.

Ecological Impact Assessment

3.21 A literature review was conducted to establish the ecological baseline condition of the Assessment Area and assessment of potential impacts conducted in accordance with the Environmental Impact Assessment Ordinance Technical Memorandum (EIAO TM) requirements.

3.22 The water quality impact modelling results indicated that the potential impact zone would be restricted to the Victoria Harbour and Western Buffer WCZs. No impact on ecological resources outside of this zone is expected.

3.23 The existing SCISTW outfall location was chosen in an area with low ecological resources. No adverse ecological impact is anticipated from the Project because :

- Improvement to water quality with reduction in *E. coli* levels in Western Buffer WCZ and western Victoria Harbour WCZ;
- Localised and small changes in TRC, CBPs and dissolved oxygen (DO) at around the existing SCISTW outfall;
- No unacceptable ecological risk on marine mammal and marine life in relation to acute and chronic effects; and
- Western Buffer WCZ and western Victoria Harbour WCZ do not support high rich ecological resources in terms of species richness.

3.24 The existing SCISTW outfall location was chosen in an area with low ecological value to avoid

adverse impacts on key ecological resources. A dosing system will be used at the ADF, to minimize the chlorine dose needed for disinfection therefore reducing the potential for generation of CBPs and TRC. As there would be no adverse marine ecological impact from the proposed disinfection facilities, no mitigation measure would be required.

Fisheries Impact

3.25 A literature review was conducted to establish the fisheries baseline condition of the Assessment Area. The water quality impact modelling results indicated that the potential impact zone would be restricted to the Victoria Harbour and Western Buffer WCZs. WQOs would be met and no adverse impact at the Ma Wan FCZ is predicted by the water quality modeling. The discharged C/D HATS effluent would not adversely impact the fisheries resources including fish eggs and larvae, in view of the predicted low seawater concentrations of residual chlorine and chlorination by-products, which would comply with the available marine water quality standards that were developed to protect aquatic biota.

3.26 The existing SCISTW outfall location was chosen in an area with low fisheries resources. No adverse fisheries impacts are anticipated from the Project because :

- WQOs met at Ma Wan FCZ
- Improvement in water quality with reduction in *E. coli* levels in Western Buffer WCZ, including Ma Wan FCZ and western Victoria Harbour WCZ;
- Localised and small changes in TRC, CBPs and DO at around the existing SCISTW outfall;
- Ecological risk on fisheries in relation to acute and chronic effects within criteria; and
- Western Buffer WCZ and western Victoria Harbour WCZ do not support high catch of fisheries.

3.27 As there would be no adverse fisheries impact from the proposed disinfection facilities, no mitigation measures would be required.

Waste Management Implications

3.28 Waste types generated by the construction activities are likely to include Construction & Demolition (C&D) material from excavation works, general refuse from the workforce, and chemical waste from the maintenance of construction plant and equipment. Provided that these wastes are handled, transported and disposed of using approved methods and that the recommended good site practices are strictly followed, adverse environmental impacts are not expected during the construction phase.

3.29 In the event that minor chemical wastes are produced during operation and maintenance of the Project, the relevant mitigation and control requirements for chemical wastes should be observed. Provided that the handling, storage and disposal of chemical wastes are in accordance with the requirements, adverse environmental impacts are not expected to result during the operation phase.

Hazard to Life

3.30 Hazard to life impact associated with the proposed disinfection facilities at SCISTW was quantitatively assessed, with consideration of identified precautionary measures / operation procedures that minimize the risks associated with the chemicals related operations. The individual risk and societal risk associated with the chemicals related operations were found to be acceptable in accordance with the risk guidelines stipulated in the Annex 4 of the EIAO TM. Hence, the hazard to life impact due to the Project is considered to be acceptable.

Impact on Human Health and Man-made Environment

3.31 Impact of atmospheric TRC and CBPs deposits on human health and man-made environment up to date is not an issue of concern as revealed in the findings of the desktop study with literature review. In addition, based on the evaluation of TRC and CBPs concentration levels in the effluent discharged from SCISTW estimated from the water quality assessment and physical properties of the contaminants, concentrations of TRC and CBPs in air would be insignificant and therefore, it is unlikely to have any potential human health and man-made environmental effects caused by atmospheric TRC and CBPs deposits.

Environmental Monitoring and Audit

3.32 Environmental monitoring and audit (EM&A) requirements have been specified in an EM&A Manual. The EM&A Manual contains full details of proposed baseline and compliance monitoring programmes, as well as performance specifications, audit requirements and monitoring procedures.

4 OVERALL CONCLUSION

4.1 The findings of this EIA Study have determined the likely nature and extent of environmental impacts predicted to arise from the construction and operation phases of the Project. The EIA has, where appropriate, identified precautionary design and mitigation measures to ensure compliance with environmental legislation and standards.

4.2 Overall, the EIA Study for the proposed ADF has predicted that the Project, with the implementation of the proposed precautionary design and mitigation measures for construction and operation phases, would comply with all applicable environmental standards and legislation. This EIA has also demonstrated the acceptability of the residual impacts from the Project. EM&A mechanisms have been recommended, where necessary, to verify the accuracy of the EIA predictions and the effectiveness of recommended precautionary design and mitigation measures.