EXECUTIVE SUMMARY

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Main Drainage Channels for Ngau Tam Mei, Yuen Long and Kam Tin: *Environmental Impact Assessment*

13 June 1996

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13 June 1996

Reference C1203

For and on behalf of ERM-Hong Kong, Ltd			
Approved by: T. Palson-smith			
Position: PRINCIPAL CONSULTANT			
Date: 13 June 1996			

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INTRODUCTION

The following comprises the Executive Summary of the Main Drainage Channels (MDC) for Ngau Tam Mei, Yuen Long and Kam Tin: Environmental Impact Assessment (EIA).

This report summarises the proposed construction and operation of the Main Drainage Works and the potential environmental impacts and mitigation measures necessary to reduce the residual impacts to established standards and guidelines.

1.1 BACKGROUND TO THE STUDY

The plain of Yuen Long and Kam Tin, the main agricultural area in Hong Kong, is drained by two major water courses; the Kam Tin River draining the eastern half and Yuen Long Creek draining the western half of the plain. Over the years, the rivers have been subject to intensive anthropogenic disturbance leading to recurrent flooding in the Yuen Long/Kam Tin/ Ngau Tam Mei Basin. To alleviate the frequent flooding, two main drainage networks, the Yuen Long and Kam Tin Main Drainage Channels (MDC) and the Ngau Tam Mei MDC which flow through the Yuen Long Creek into Inner Deep Bay were recommended in the North West New Territories Base Strategy Studies.

In addition to the problems of flooding, the watercourses within the study area are among the most polluted of the Territory. The various watercourses are heavily polluted by a combination of residential and commercial effluent and livestock waste. Solid waste is often deposited into the watercourses and, in some areas, burned along the stream banks. As a result the water quality is very poor, often anoxic. The Deep Bay ecosystem is reported to be over-stressed as a result of pollution from Yuen Long and Kam Tin and the adjoining area of Shenzhen in China.

In contrast, the Mai Po Marshes, covering almost 400 ha of inter-tidal land on the edge of Deep Bay, are designated as a Site of Special Scientific Interest (SSSI). The Marshes and adjoining tidal mudflats of Inner Deep Bay (also an SSSI) are a wetland system of international importance providing feeding, nesting and resting habitat for hundreds of thousands of birds from over 250 species, many of which are inter-hemisphere migratory, rare and endangered. The area was designated as a Ramsar Site in September 1995. Other smaller related SSSIs are located close to Mai Po Marshes and along the Deep Bay coastline.

Extensive environmental studies and surveys have been conducted to study and to identify the net and cumulative environmental impacts of the Main Drainage Works, and to recommend measures to mitigate these impacts. It is understood, however, that a number of objections were received during the gazetting of the Works for the Stage One Phase 1 of the Yuen Long and Kam Tin MDCs under the Foreshore and Sea-bed (Reclamation) Ordinance. Subsequently, in the course of resolving the objections, it has been agreed to reassess the water quality implications if full enforcement of the Livestock Wastes Control Scheme in Yuen Long could not be implemented by mid-1993 as was assumed in previous assessments.

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ERM-Hong Kong, in association with Maunsell Consultants Asia Ltd and Ecosystems Ltd, have been commissioned by the Government of Hong Kong, Territory Development Department New Territories North Development Office (TDDNTNDO) to undertake an Environmental Impact Assessment Study for the MDCs for Ngau Tam Mei, Yuen Long and Kam Tin.

This report summarises impacts of the Main Drainage Channels (MDC) for Ngau Tam Mei, Yuen Long and Kam Tin. Included in this assessment are the 60CD, 43CD, 30CD, 29CD and 22CD sub-projects of the overall MDC drainage project. *Figure 1.1a* shows the Study Area for the proposed MDC.

1.2 SCOPE OF WORK

An EIA for the 43CD and 30CD works was prepared and submitted in January 1995 to allow for any identified mitigation measures and environmental monitoring and audit requirements to be included in the design prior to the tendering process. The report was endorsed by the Advisory Council on the Environment (ACE) in February 1995. The construction for 43CD commenced in October 1995 and the construction for the Sha Po element of 30CD will commence in July 1996.

This EIA for MDC will consolidate the findings of the EIA for 43CD and 30CD works and add assessments for the remaining works of the MDC (60CD, 29CD and 22CD) to assess the scale, extent and severity of cumulative environmental and ecological impacts to Deep Bay and areas along the Main Drainage Works alignment with limited or full enforcement of the Livestock Waste Control Scheme (LWCS).

1.3 STRUCTURE OF THE REPORT

This Executive Summary is organised into four sections. Following this introductory section, the subsequent sections are as described below:

Section 2 describes the proposed MDC project, individual MDC sections and the construction programme;

Section 3 discuss the scale, extent and severity of cumulative environmental impacts with respect to ecology, water quality, waste management, noise and air quality for the construction and operational phases and identifies any mitigation measures to reduce potential impacts to within established standards and guidelines;

Section 4 summarises the environmental impacts associated with the construction and operation of the MDC works.

2.1 INTRODUCTION

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The Yuen Long/Kam Tin/Ngau Mei Basin, the largest basin in the NWNT, is the main agricultural area in Hong Kong. The area is drained by two major watercourses; the Kam Tin River draining the eastern half and Yuen Long Creek (Shan Pui River) draining the western half of the plain. The current hydrological conditions are the result of natural accretion in Deep Bay, reclamation and, in addition, intensive anthropogenic disturbances to both rivers in recent years. These disturbances include discharge of domestic sewage, industrial effluent, agricultural runoff and livestock waste. The upper parts of the drainage basins are generally steep and covered in scrub or woodland, and so flooding is not a significant problem. Development has mainly been confined to the lower parts of the basin, where the capacity of the watercourses is exceeded and banks are overtopped during even moderate storms. This has led to regular and repeated severe flooding impacts within the Study Area.

In order to alleviate the problem of severe flooding in the lower and middle parts of the Yuen Long/Kam Tin and Ngau Tam Mei Basins, two networks of drainage channels were recommended:

- flowing via Yuen Long Creek into Inner Deep Bay;
- the Yuen Long and Kam Tin MDC and the Ngau Tam Mei MDC.

The MDCs will be constructed in the following stages, as shown in *Figure 1.1a*.

- Stage 1, Phase 1 works (60CD), which are presently in progress and anticipated to be completed by September 1997, comprise the construction of wide river channels which will enter Deep Bay (*Figure 2.1a*);
- Stage 1, Phase 2 works (43CD), , which are presently in progress and anticipated to be completed by July 1998, comprise the construction of new river channel sections (*Figure 2.1b*);
- implementation of Village Flood Protection Works, 30CD (Figure 2.1c -f);
- the remainder of the main drainage channels for Yuen Long and Kam Tin (22CD) and the artificial channelisation (widening, deepening and lining) of natural meandering rivers/streams (*Figure 2.1g -h*); and
- the channelisation of existing natural river/stream sections and also the construction of a new channelized section (29CD) running south to 60CD of the Main Drainage Works (*Figure 2.1i*).

All these river training projects will basically involve bend straightening, channel deepening and widening although the treatment for the bank and bottom protection may vary.

CONSTRUCTION PROGRAMME

The implementation programme of the overall MDC for Yuen Long, Kam Tin and Ngau Tam Mei is given in *Table 2.2a*.

Table 2.2aImplementation Programme for the MDC

Drainage Works	Commencement Date	Completion Date	
60CD Contract A	October 1993	January 1997	
60CD Contract B	April 1994	September 1997	
43CD	October 1995	July 1998	
22CD Phase 1	May 1998	November 2000	
22CD Phase 2	July 1998	November 200 D	
22CD Phase 3	February 1999	February 2001	
22CD Phase 4	November 1999	May 2002	
29CD Phase 1	February 1998	February 2001	
29CD Phase 2	February 1999	February 2001	
30CD - Sha Po Tsuen	July 1996	July 1998	
30CD - Pok Wai	October 1998	October 2000	
30CD - Chuk Yuen Tsuen/Ha San Wai	February 1999	July 2001	
30CD - Mai Po Lo/San Tsuen	July 1999	July 2001	
Source : Drainage Service Department letter ref (13)in DP 5/16/20-8			

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Ecology

3.1.1 Ecological Assessment

The baseline ecological conditions within the zone of impact from the MDC works has been evaluated by reviewing existing information and expanding, verifying and updating it with focused field surveys, including additional avifauna surveys. Habitats that will be affected by the construction of the MDC works have been identified. Additionally, the ecological value of the habitats affected have been qualitatively assessed. Mitigation measures have been developed and recommended to alleviate and minimise the potential ecological impacts of the MDC works on these identified habitats as far as possible. Of these habitats, which included dryland, aquatic, riparian, mangrove and freshwater wetlands, impacts to mangrove and freshwater wetlands were of greatest concern owing to the importance of these habitats in supporting other species, e.g. invertebrates and avifauna, respectively. Mitigation measures undertaken to reduce the ecological impacts of the MDC works are described below.

Since the 60CD and 43 CD works are already under construction, it was possible to evaluate the actual impacts on wildlife. An avifauna survey commissioned by DSD for 60CD works found that although the area in the vicinity of the works are no longer inhabited by egrets, the MDC works, however, have lent themselves to become habitats for other species of avifauna, such as ducks. The 60CD works is an environmentally sympathetic design and adverse impacts imposed by these works are not anticipated.

Mitigation

Mangroves

Measures has been included in the design to ensure that existing mangroves are preserved wherever possible. A significant mitigation initiative was the development of a revised scheme for 60CD Contract A which resulted in a reduction of approximately 80% in the area of mangroves to be lost (from 88 ha to 17 ha) as shown on (*Figure 3.1.2a*). The revised plans were a considerable improvement on the original scheme to address ecological issues such as the protection of two macrobenthic species, the fiddler crab (*Uca cf. dussumieri*) and the burrowing sea anemone. The revised design also allowed for the conservation of other intertidal habitats important to the New Shan Pui egretry. Moreover, some of the mangroves lost due to construction of the MDC works will be replaced, thereby reducing the net loss to 4.28 ha The landscaping mitigation measures are described below.

Fish Ponds

(a) Retainment of Fish Ponds

The original 60CD Contract A design featured a wide, dredged area at the river mouth to serve as flood storage capacity. However, this design required the resumption and destruction of eight fishponds of considerable ecological value.

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After careful consideration of the environmental impacts of this design to ecology, the original 60CD plans were revised to retain the eight fishponds which account for 10.5 ha of potential ecological habitat (*Figure 3.1.2b*).

(b) Reinstated Fish Ponds

Opportunities have been identified to minimise fish pond area to be lost due to the MDC works as far as possible. In addition to the eight fish ponds at the mouth of the Shan Pui River which have been mitigated for retainment for 60CD works, specified fish ponds in the vicinity of 60CD, Contract A and B, 43CD, 29CD Phases 1 and 2, 30CD and 22CD Phase 1 have been designated for reinstatement into commercial fisheries after the completion of construction works. As a result of these mitigation measures, the original loss of 120.5 ha of fish ponds attributed to the works have been reduced to a combined net loss of approximately 86.95 ha. This represents approximately 7.2% of the total area of fish ponds in the Territory.

River Channels

Although the MDC works will contribute to a loss of 18.42 km of river channel length, the total length of new channel gained would be 28.41 km, resulting in a net gain of 9.99 km. Given that certain sections of the new channels will be unlined, as in the case of 60CD (Contract A and B), these unlined sections consisting of boulder, gravel, or sand channel bed would be suitable for the recolonisation of flora and fauna after completion of the works. Also, the loss of wildlife habitat will be mitigated by paving the inside embankment slopes of the channels with grasscrete. This will provide wildlife habitat if vegetation grows tall and dense enough to provide escape or feeding cover for birds. Furthermore, many of the abandoned channel meanders which account for approximately 11.16 km, outside the works area offer an opportunity to regain lost freshwater habitat which could be managed to provide foraging habitat for wading birds. The conservation potential of abandoned stream segments could additionally be greatly enhanced through the incorporation of lands in the oxbow areas. It is understood that the rehabilitation of disused meanders will be addressed in association with the local drainage needs which will be reviewed in an upcoming Drainage Master Plan Study under TEL 3. It is anticipated that the oxbow areas and the disused meanders will be restored naturally.

Landscaping

Loss of dry land habitats such as agricultural fields and fish pond bunds can be partially mitigated through revegetation of embankment slopes with species of ecological utility. Landscaping plans provided by TDD outline the areas along the embankments of 60CD (Contract A and B) in which mangroves will be replanted. The replanted areas will restore both form and function of the mangroves which were unavoidably lost due to the 60CD works and will reduce long-term habitat loss. As stated above, a reduction from 88 ha to 17 ha of mangroves will be lost from 60CD Contract A due to redesign initiatives. However, 4.05 ha along the embankments of 60CD Contract A have been zoned for mangrove replanting. Thus, a net loss of only 12.95 ha of the original 88 ha of mangroves will be lost due to the works. In addition, 8.67 ha of mangroves will be planted along the 60CD Contract B embankments. A total area of 12.72 ha of mangrove transplantation is a novel technology in Hong Kong, but has been an accepted technology in other Asian locations. The anticipated success of the

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reintroduction of mangroves (in this project) to the environment may set a precedent towards the mitigation of future main drainage channel works.

Furthermore, vegetation to be lost due to the 60CD works will be partially replaced on areas outside the MDC embankments following completion of construction of the works. A total of 16.99 ha of vegetation (woodland) will be planted.

Residual Impacts

3.1.3

Despite the mitigation measures mentioned above, some change to wetland habitat conditions from existing fish ponds to river channels and embankment are unavoidable. However, conceptual recommendations are being made for offsite wetland compensation have been proposed in the EIA Study. The relative ecological value of the residual losses of all of the MDC works have been qualitatively assessed with the following conclusions:

There will be a net loss of 86.95 ha of fish pond area due to the MDC works. This loss represents about 7.2% of the Territory's remaining total. Of the loss, 68.14 ha are grade A fish ponds, 5.2 ha are grade B and 13.61 ha are of grade C. The majority of the grade A fish pond loss is attributed to 60CD Contract A and Contract B. The ecological value of fish ponds is the subject of an ongoing study commissioned by the Planning Department.

Due to its close proximity to the mangrove habitat in the Deep Bay Area, mangrove loss will be incurred by the 60CD works. Residual impacts have been minimised through the revision of the original 60CD engineering design, the potential loss of mangroves has been reduced to a loss of 17 ha. Furthermore, the replanting of mangroves along the embankments of the created 60CD Contract A channel will partially compensate for these losses. The net mangrove loss after mangrove replanting will be 4.28 ha.

The majority of the MDC works will result in the creation of river channels that will exceed the lengths of existing river channels lost. Of the works, 60CD Contract A and B will generate the largest compensation of lost channel. As mentioned previously, some of the habitat loss due to the construction of the MDC will be offset by abandoned channel meanders outside the works areas. These abandoned channel meanders offer an opportunity to regain lost freshwater habitat which could be managed to provide foraging habitat for wading birds following completion of construction. The practicality of the management of such areas will be reviewed in the Drainage Master Plan Study under TEL 3.

The conceptual recommendations of proposed off-site mitigation measures in this EIA study include the following considerations:

- long term conservation management of fish ponds adjacent to Mai Po Nature Reserve; and
- natural restoration of abandoned channel meanders outside the works area.

It is intended that the details and the implementation of these proposals be examined by a consultancy study on wetland compensation, subject to policy approval and availability of funds.

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60CD, 43CD, 29 CD and 22 CD of the MDC

The potential sources of water quality impacts from the construction of the MDC project could involve disturbance to natural processes, resuspension of contaminated material, alteration of supply or organic wastes and nutrients downstream; construction runoff and drainage, debris and rubbish, liquid spillages and sewage effluents.

In general it is predicted that disturbances to water bodies will be temporary and localised during construction. As described, auger dredgers or closed-grab dredgers recommended will minimise the potential for water quality impacts.

With the careful operation of the dredgers and implementation of recommended mitigation measures, dredging work is not expected to cause non-compliance with the Trigger, Action, or Target (TAT) levels. In inaccessible areas where dredgers cannot be used, tightly sealed closed-grab land based excavators are recommended in river sections when handling wet material to minimise sediment loss. Where dry material is handled in non-river sections, conventional excavators may be used.

The potential release of pollutants from resuspended sediment will cause slight fluctuations in the pollutant levels, however, this is expected to be within the natural variation range of pollutant levels in the existing river water.

Adverse water quality impacts may result from uncontrolled site runoff and poor construction practice. It is recommended that proper site management and good housekeeping practices such as the use of cofferdams to contain suspended sediment and control measures on the runoff and drainage will be essential to ensure that construction activities will not cause incompliances in the TAT levels. The control is of particular importance when the construction works are close to rivers, the freshwater marshes at Sha Po, the Au Tau Fisheries Research Station and fish ponds.

To ensure effectiveness of the recommended, practical and cost effective management practices, water quality monitoring and audit will be essential to proactively identify any deterioration in water quality and to check that the construction activities are not causing any incompliances with the TAT levels.

Provided that the recommended mitigation measures are diligently implemented, it is considered that construction activities for the MDCs will cause only local and temporary disturbance, and no water quality impacts in excess of WQO standards are envisaged.

Village Flood Protection Works - 30CD Stage 1

Works for the Sha Po, Pok Wai, Chuk Yuen, and Mai Po Lo Wai/San Tsuen VFPW are not envisaged to create adverse water quality impacts. The scale of disturbance on the water bodies is comparatively smaller than works for the other contracts of the MDC. In areas where dredgers are inaccessible, closedgrab excavators are recommended to minimise the leakage and loss of sediment from the excavation.

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OPERATIONAL PHASE WATER QUALITY SUMMARY

60CD, 43CD, 29CD, and 22CD of the MDC

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The MDC project will undoubtedly bring about drainage improvements both on a local and large scale. The straightened channels should also improve water quality through increased dispersion of pollutants and aeration of the water column. In addition, the elimination of tidal intrusion will aid pollutant dispersion.

Local Situation: Locally it is anticipated that large amount of SS brought down from various pollutant sources will accumulate behind the fabric dams and in widened stretches of the MDCs, which will substantially reduce downstream sediment pollution. Deposited accumulated material behind the fabric dams and in the widened channels can be removed with regular maintenance dredging.

Further downstream, the channels are inter-tidal with reduced velocity as a result of widening of the channel, further sedimentation is expected. Under low flow conditions, the flow will meander across the widened river bed which may result in sediment forming bars and islands. It is anticipated that substantial amount of the pollutant will settle further downstream of the fabric dam (which should be cleared with regular maintenance), thus reducing the total pollutant load reaching Deep Bay. In the event of floods, any such pollutants will be washed down into Deep Bay. Thus, the increase in pollutant load to Deep Bay will only be occasional and temporary after the storm events. In addition, the routine maintenance regime should be designed such that deposited polluted sediments are routinely and regularly removed from river channels to minimise transfer of sediment pollution to Deep Bay.

The velocities reduce in the lower reaches of the MDCs where the channels are wider and deeper. The velocities in the downstream reaches are approximately 20% lower than the velocities modelled for the existing channels for the TEL 2 report. This would result in approximately 20% less suspended material and greater deposition.

The total flow from the Kam Tin River and Yuen Long Creek entering Deep Bay is minimal when compared to the annual water exchange within this water body. Thus it is anticipated that the increase flow from the MDCs project alone will have a minimal effect on the overall circulation pattern and water movement in Inner Deep Bay. In terms of pollutant load, the greater flushing of the river will mean that in the interim period prior to full LWCS, WPCO and SMP implementation, the existing pollutant loads into Deep Bay will continue although a substantial proportion of the pollutants are anticipated to settle out along the river banks as described earlier, which will enable controlled collection and environmentally acceptable disposal.

Village Flood Protection Works - 30CD Stage 1: The VFPW will significantly improve the drainage for the Pok Wai, Sha Po, Chuk Yuen Tsuen/Ha San Wai and the Mai Po Lo Wai/San Tsuen areas. In view of the residential nature of theses villages, drainage from these areas is not anticipated to be contaminated. Silt traps are recommended to reduce the volume of potential sediment that will be washed downstream.

Impacts upon Deep Bay: It is considered that the extent of the improvements resulting from the MDCs will greatly rely on the successful implementation of

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the LWCS, Yuen Long and Kam Tin SMP and the WPCO which would significantly reduce the pollutant load to the receiving water bodies.

With the amended LWCS, an improved compensation scheme should attract more livestock farmers to cease their livestock rearing businesses or alternatively adopt the livestock waste treatment systems. While it is difficult to estimate the percentage reduction, a further reduction in the BOD loading on the river is anticipated when the LWCS comes into effect for the Kam Tin area and Ngau Tam Mei by July 1996 and July 1997, respectively.

According to the SMP programme, the Kam Tin area will be served by a sewerage system by 1999 to 2005 depending on the areas. It is estimated that around 70% of the population in the Yuen Long catchment will be served by sewerage system. Domestic sewage discharges into the Kam Tin River from unsewered facilities should thereafter be greatly reduced.

Furthermore, the successful enforcement of the WPCO and the recent implementation of the Waste Disposal (Chemical Waste)(General) Regulations will largely eliminate industrial discharges in particular, chemical waste such as electroplating waste which contain high levels of heavy metals, from entering the water bodies. Any industrial discharges into the rivers will have to comply with the TM limits.

Overall Operational Water Quality Conclusion:

This semi-quantitative assessment has determined that, in addition to major improvements in drainage resulting from the MDCs, the straightened and widened channels, and halting of tidal intrusion by the construction of fabric dams, will lead to local improvements in water quality. These will result from increased aeration and pollutant dispersal downstream. Sedimentation behind the fabric dams and in the widened channels will allow effective removal of a large proportion of the pollutant load before it can enter Deep Bay.

However, effective enforcement of the LWCS, WPCO and the Yuen Long and Kam Tin SMP comprise the key to long term water quality improvement in sections 60CD, 43CD, 29CD, and 22CD of the MDCs, although these factors are beyond the control of the current project. In the long term after full enforcement of the LWCS, the Yuen Long and Kam Tin SMP and WPCO, the flows into Deep Bay arising from the study area will be relatively small compared to the total receiving flows and will be rapidly dispersed.

In addition, as modelling has not been undertaken as part of this assessment, the conclusions with respect to impacts upon Deep Bay are thus semi-quantitative. However, an EPD consultancy study is currently underway to draw up strategic options for managing water quality in the Deep Bay catchment. This involves determining the overall flow and water quality regime within Deep Bay, and is developing a predictive mathematical model for quantifying the assimilative capacity of the Bay. This model should be used to verify and clarify the extent of those water quality impacts resulting from the operation of the MDCs, determined through the EIA.

3.4

SUMMARY OF WASTE MANAGEMENT IMPACTS DURING CONSTRUCTION PHASE

It is expected that the management of dredged/excavated materials arising from

the MDC works will be the most important waste management issue during the Construction Phase. In terms of minimisation of environmental impacts, priority should be given to land-based disposal options and marine disposal should be considered only as a last resort. A number of land-based disposal options, including landfilling, reuse on-site and off-site, have been examined. In addition, other land-based treatment options have also been explored.

Disposal of dredged/excavated materials generated from the MDC works at the existing strategic landfills would be hindered by the large volume of such materials, their high moisture contents and the potential presence of contaminants. Difficulties in reducing the moisture content of the dredged/excavated materials to a level below 30%, as directed by EPD, are expected with present technologies. In addition, contaminated materials would not be accepted at the strategic landfills unless it can be demonstrated that codisposal of contaminated sediments would not cause adverse impacts to the existing strategic landfills. Studies on the feasibility of co-disposal have been conducted in other countries but the efficiency and practicality of co-disposal within the local context cannot be confirmed without further detailed studies, which are not within the scope of the present EIA. Re-use of dredged/excavated materials is unlikely to be feasible as such materials are in general not suitable for engineering purposes. Alternative options for the treatment of contaminated sediments are unlikely to be viable for the MDC works in view of the large volume of material to be treated and associated prohibitive cost and land requirements. Marine disposal is therefore still recommended as an interim option in view of the above considerations. Potential disposal options for dredged/excavated materials with different degree of contamination envisaged at present are as follows:

• Class A (uncontaminated material):

marine disposal at open water disposal sites, eg East of Ninepins, or designated marine borrow areas, eg North Lantau and South Tsing Yi MBAs;

• Class B (moderately contaminated material):

marine disposal at designated marine borrow areas, eg North Lantau and South Tsing Yi MBAs; and

• Class C (seriously contaminated material):

marine disposal at designated contaminated mud pits (CMPs), eg East Sha Chau CMPs.

These interim recommendations should however be subject to review and verification by the outcome of the TEL3 Study.

For other categories of waste, including construction waste, chemical waste and general refuse, waste reduction and management measures are recommended to control the waste related environmental impacts. With the adoption of such measures, no adverse impact from wastes other than dredged/excavated materials is expected.

3.5

SUMMARY OF WASTE MANAGEMENT IMPACTS DURING OPERATION PHASE

The management of dredged material outlined in the TEL1 and TEL2 study are discussed. With recent developments in the management of contaminated mud, the recommended options in the TEL1 and TEL2 may no longer be appropriate in view of the potential contamination of the rivers and underground water. In general, disposal options for dredged/excavated materials from the construction phase would be applicable to the operational phase maintenance dredging. However, the appropriateness of these recommended dredging methods and contaminated mud disposal will be reviewed in the upcoming TEL3 Sedimentation Study which will address the environmental impacts of maintenance dredging and associated contaminated mud disposal.

3.6 CONSTRUCTION NOISE

This assessment has indicated that both the MDC works (60CD, 43CD, 29CD, 22CD) and VFPW for 30CD Stage 1 have the potential to create significant impacts at nearby NSRs from unmitigated construction activities. As a result, mitigation measures in the form of reduced plant teams, noise barriers and onsite noise management are recommended to protect nearby NSRs from excessive impacts.

It is believed that use of these types of mitigation measures should reduce impacts at nearby NSRs from daytime and certain evening, construction operations to within established standards and guidelines. It is not recommended that night time (2300-0700) construction operations be carried out for any phase of construction activities.

3.7 OPERATIONAL NOISE

In this assessment, it has been concluded that both the MDC (43CD) and VFPW will have impacts at the nearby NSRs from unmitigated operational noise. For health and safety reasons, mitigation measures have been recommended to reduce the noise level inside the plant room to $L_{Aeq 30min} 85 \text{ dB}$. Where the reduction of the noise level inside the plant room is insufficient to protect the nearby NSRs, further mitigation has been suggested.

3.8

CONSTRUCTION AIR QUALITY

This assessment has indicated that both the MDC (Sections 60CD, 43CD, 29CD and 22CD) and VFPW for 30CD Stage 1 have the potential to create significant impacts at nearby ASRs from unmitigated construction activities. Changes to local air quality have been predicted to occur from elevated levels of dust (TSP) activities. As a result, mitigation measures in the form of dust suppression techniques (wheel washing, watering of roads, etc.), reduced plant teams and onsite plant and haul road management are recommended to protect nearby ASRs from excessive impacts. The recommended practical and cost-effective measures to prevent odour nuisance from dredged or excavated spoil will minimize the generation of odours and will minimize adverse odour impacts.

It is believed that use of these types of mitigation measures as well as the placement of limitations on all construction activities taking place within 100m

of ASRs, should reduce impacts at nearby ASRs to within established standards and guidelines (i.e. within the AQO limits).

OPERATIONAL AIR QUALITY

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There will be no sources of air pollutant emission during the operational phase of the MDC . Potential air quality impacts may arise during maintenance dredging. It is anticipated that the impacts from maintenance dredging will be similar to capital dredging during the construction phase but possibly to a smaller scale as less dredged material will be handled for maintenance dredging. Mitigation measures recommended for the construction phase will generally apply to maintenance dredging.

3.10 ENVIRONMENTAL MONITORING AND AUDIT (EM&A)

A stand alone Environmental Schedule has been formulated and comprises the EM&A requirements, where appropriate, to monitor the efficacy of mitigation measures recommended in the MDC EIA.

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The EIA for MDC concluded that construction and operational phase impacts to air, noise, and water can be mitigated to acceptable residual levels in full compliance with statutory and non-statutory standards and guidelines.

With regard to wastes management, disposal to both landfill and the marine environment has been considered and preliminary recommendations made. However, it is considered that proposals will be finalised by the TEL3 study to prevent delay to the MDC EIA.

There will be a net loss of 86.95 ha of fish ponds and 4.28 ha of mangroves due to the MDC works. The majority of the losses of fish ponds and mangrove are attributed to the 60 CD works. Due to revision of the original 60 CD engineering design, reinstatement of fish ponds, planting of mangroves along channel embankments and other on-site mitigation measures, these habitat losses have been reduced to a minimum.

Despite the mitigation measures, some change of wetland habitat conditions from existing fish ponds to river channels and embankments are unavoidable. However, conceptual recommendations of off-site wetland compensation have been proposed in the EIA study. The details could be examined in the future studies. The assessment of the ecological value of fish ponds and the practicality to mitigate such changes of wetland habitat conditions will be subject to findings of other studies such as the ongoing study commissioned by the Planning Department on the ecological value of fish ponds and the proposed study on wetland compensation which is being considered at policy level. The practicality of the management of abandoned channel meanders will be reviewed in the Drainage Master Plan Study under TEL 3.

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