For discussion **PWSC(2003-04)57**
on 17 December 2003

ITEM FOR PUBLIC WORKS SUBCOMMITTEE OF FINANCE COMMITTEE

HEAD 705 – CIVIL ENGINEERING
Environmental Protection – Refuse Disposal
161DR – Restoration of Shuen Wan Landfill – post-completion environmental monitoring work

Members are invited to recommend to the Finance Committee the upgrading of **161DR** to Category A at an estimated cost of $24.1 million in money-of-the-day prices for the continuation of the environmental monitoring work at the Shuen Wan Landfill for a further period of seven years.

PROBLEM

We have carried out an environmental review on the restored Shuen Wan Landfill. The review has revealed that further environmental monitoring work at the site is necessary. If the monitoring work is to be discontinued, the landfill site may have adverse environmental impacts and may pose a threat to the safety of the public.

PROPOSAL

2. The Director of Environmental Protection, with the support of the Secretary for the Environment, Transport and Works, proposes to upgrade **161DR** to Category A at an estimated cost of $24.1 million in money-of-the-day (MOD) prices for the continuation of the environmental monitoring work at the Shuen Wan Landfill for a further period of seven years.

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PROJECT SCOPE AND NATURE

3. The scope of the existing environmental monitoring work proposed for continuation comprises –

(a) operation and maintenance of a landfill gas management system to control gas emission and to prevent off-site gas migration;

(b) operation and maintenance of a leachate management system to control surface and groundwater infiltration into the landfill and to extract, collect and dispose of the landfill leachate;

(c) environmental monitoring and auditing; and

(d) maintenance of landscape and site infrastructure.

The site plan is at Enclosure 1. We plan to continue with the environmental monitoring work at the Shuen Wan Landfill for a further period of seven years from December 2004 to December 2011.

JUSTIFICATION

4. All landfills produce landfill gas and leachate[1]. Landfill gas, which is a product of refuse decomposition, is malodorous and potentially asphyxiating, flammable and explosive. Leachate is highly polluting and, if not properly controlled, may result in serious contamination of water bodies due to infiltration or direct discharge of leachate.

5. Municipal solid waste, when disposed of at landfills, does not exhibit homogeneous geotechnical properties, as it is subject to a continuing biological degradation process. This results in differential settlement of the landfill's surface and may lead to slope instability problems. We therefore need to monitor and improve slope stability at landfills. For some landfills, we also need to stabilise the natural slopes adjacent to the top platform of landfills to prevent possible boulder falls or soil debris flows.

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[1] "Leachate" is the water which has permeated through the waste mass.

6. The Shuen Wan Landfill is located in Tai Po. It commenced operation in 1973 and was closed in 1995. To minimise the adverse environmental impacts and to put the land to productive use, we sought funding approval from the Finance Committee (FC) in 1995 vide PWSC(95-96)15 for design and construction of the restoration facilities[2] as well as seven years' post-completion work to maintain the facilities and monitor the landfill gas migration and leachate pollution. FC also agreed that we should carry out an environmental review every five years, starting from the commencement of the environmental monitoring work, to determine if the landfill site has been completely restored and if further monitoring is needed. If further monitoring work is required, funding approval from FC would have to be sought again.

7. In late 1997, the construction of the restoration facilities was completed, and the post-completion environmental monitoring work commenced[3]. In 1999, a temporary golf driving range began to operate at the site.

8. In late 2002, the Environmental Protection Department (EPD) carried out an environmental review of the landfill site as required by the FC. The review was completed in April 2003. It confirmed that further monitoring work at the landfill is necessary. Although the amount of landfill gas and the pollution level of leachate generated have substantially decreased since 1997, they are still of significant quantity and require continuous control and treatment[4].

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[2] The restoration facilities include (a) a landfill gas management system to control gas emission and prevent off-site gas migration; (b) a leachate management system to control surface and groundwater infiltration into the landfill and to extract, collect, and dispose of the landfill leachate; (c) an engineered capping layer (with low permeability) and a surface water drainage system to reduce infiltration of rain water into the waste mass thereby reducing the amount of leachate to be treated; and (d) improvements to the slope stability and landscaping of the landfill site and other ancillary engineering works.

[3] Funding was sought for the first seven years' post-completion environmental monitoring work up to December 2004.

[4] For example, the landfill gas generation rate has reduced from 2 500 cubic metres per hour (m^3/hour) in 1997 to 650 m^3/hour in 2003. However, the methane content in the landfill gas is around 50%, compared with 59% in 1997. Such volume of landfill gas and a methane content level still requires monitoring as the landfill could only be considered as fully restored from the perspective of landfill gas safety when the methane content is reduced to 1%. For the leachate, the concentration level of total nitrogen has reduced from an average of about 1 100 milligram per litre (mg/l) by some 38% to around 700 mg/l between 1998 and 2003; and the chemical oxygen demand by 75% from about 1 000 to 260 mg/l. However, the current total nitrogen content still exceeds the acceptable discharge standard of 200 mg/l stipulated in the Technical Memorandum of the Water Pollution Control Ordinance for discharge to Government sewers.

Also, site settlement is expected to continue and regular maintenance work will be required to maintain the surface drainage, slopes and internal roads. Hence, it is necessary to continue on-site monitoring to ensure that the site poses no threat to the safety of the public and has minimal adverse environmental impacts, and that the existing golf driving range can continue to operate in a safe environment.

FINANCIAL IMPLICATIONS

9. We estimate the cost of the proposed post-completion environmental monitoring work for seven years to be $24.1 million in MOD prices (see paragraph 10 below), made up as follows –

	$ million	
(a) Operation & maintenance of landfill gas management system	6.0	
(b) Operation & maintenance of leachate management system	2.9	
(c) Environmental monitoring and audit	6.0	
(d) Maintenance of landscape	2.0	
(e) Maintenance of site infrastructure	7.9	
Sub-total	24.8	(in September 2003 prices)
(f) Provision for price adjustment	(0.7)	
Total	24.1	(in MOD prices)

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10. Subject to approval, we will phase the expenditure as follows –

Year	$ million (Sept 2003)	Price Adjustment Factor	$ million (MOD)
2004 – 2005	1.6	0.98225	1.6
2005 – 2006	4.5	0.97734	4.4
2006 – 2007	4.5	0.97245	4.4
2007 – 2008	3.9	0.96759	3.8
2008 – 2009	2.8	0.96638	2.7
2009 – 2010	2.8	0.96638	2.7
2010 – 2011	2.8	0.96638	2.7
2011 – 2012	1.9	0.96638	1.8
	24.8		24.1

11. We have derived the MOD estimates on the basis of the Government's latest forecast of trend labour and construction prices for the period 2004 to 2012. The cost of the post-completion environmental monitoring work will be subject to price adjustment as the period will exceed 21 months.

12. The environmental monitoring work for closed landfills may last more than two decades (could be up to 30 years). A summary of the costs of restoration and post-completion environmental monitoring work of the 12 restored landfills is at Enclosure 2. At the Shuen Wan Landfill, the first seven years' environmental monitoring work, costing about $39 million, involved landfill gas and leachate management, site maintenance work as well as over 18 000 measurements of landfill gas, some 4 000 measurements on leachate quality, over 3 000 measurements on groundwater and surface/marine water quality, which included the analysis of some 6 000 parameters annually. The environmental monitoring work will continue in the next seven years. We propose to continue the carrying out of an environmental review every five years

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to determine if the monitoring work should continue. We will continue with the existing 30-year "design-build-and-operate" (DBO) contract to ensure that continuous liability is borne by the contractor. As specified in the contract, we have the right to terminate the contract or amend the coverage of the contract provided that we give the contractor sufficient advance notice.

13. We estimate that the annual recurrent expenditure will be about $0.6 million.

PUBLIC CONSULTATION

14. The Tai Po District Council (TPDC) supported the restoration works for the Shuen Wan Landfill. In April 2001, members of the TPDC visited the site and were briefed on the progress of the monitoring work. On 27 October 2003, we consulted the Legislative Council Panel on Environmental Affairs on the proposal to continue the environmental monitoring work at the landfill site for a further period of seven years. Members supported the proposal.

ENVIRONMENTAL IMPLICATIONS

15. We completed in 1993 an initial Environmental Impact Assessment (EIA) study, covering both the restoration and post-completion environmental monitoring work, as part of the feasibility study for the restoration work of the Shuen Wan Landfill. The study indicated that the restoration and monitoring work would ensure proper control of the emission and off-site migration of landfill gas and leachate. This would ameliorate the environmental impacts of the landfill and enable the landfill site to be put to beneficial use.

16. During the contract period, we will withhold payments to the contractor if there is any non-compliance with the required environmental standards.

17. We have given due consideration to the need to minimise the generation of construction and demolition (C&D) materials, and to reuse and recycle such materials wherever practicable. We will encourage the contractor to use non-timber formwork and recyclable materials for temporary works. We will control the disposal of C&D waste to landfills or other appropriate reception facilities through a trip ticket system and will record the disposal, reuse and

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recycling of C&D materials. We estimate that the project will generate about 1 050 m^3 of C&D materials. We would reuse about 760 m^3 (72%) on site, recycle or reuse 280 m^3 (27%) as fill materials, and dispose of 10 m^3 (1%), most of which is non-inert waste, at landfills.

LAND ACQUISITION

18. The project does not require land acquisition.

BACKGROUND INFORMATION

19. We included **45DR** "Restoration of landfill sites" in Category B in August 1990. In 1993, we upgraded part of **45DR** to Category A as **92DR** "Restoration of Shuen Wan Landfill – priority works" at an estimated cost of $20 million for priority remedial measures at the landfill site to ensure that the landfill did not pose an immediate threat to the surrounding developments prior to the restoration work. In June 1995, we upgraded part of **45DR** to Category A as **154DR** "Restoration of Shuen Wan Landfill - works" at an estimated cost of $389.3 million for design and construction of the restoration facilities and the first seven years' post-completion environmental monitoring works. We upgraded **161DR** to Category B in October 2003.

20. The proposed works will not involve any tree removal and/or planting proposals.

21. We estimate that the project will continue to provide 22 existing jobs (11 professional/technical staff and 11 labourers), totalling 1 848 man-months.

Environment, Transport and Works Bureau
December 2003

Enclosure 2 to PWSC(2003-04)57

Restoration Cost of the 12 Restored Landfills

Restored Landfill (approximate site area in hectares (ha))	Cost for construction of restoration facilities ($ million) (in MOD)	Cost for the first 7 years' environmental monitoring work ($ million) (in MOD)
Shuen Wan Landfill (50 ha)	160.4	38.9
Ngau Chi Wan Landfill (8 ha) Sai Tso Wan Landfill (9 ha) Ma Yau Tong West Landfill (5 ha) Ma Yau Tong Central Landfill (11 ha) Jordan Valley Landfill (11 ha)	249	146.9
Tseung Kwan O Landfill I (68 ha) Tseung Kwan O Landfill II/III (42 ha)	369.4	104.5
Ngau Tam Mei Landfill (2 ha) Ma Tso Lung Landfill (2 ha) Siu Lang Shui Landfill (12 ha) Gin Drinkers Bay Landfill (29 ha)	332.2	108.1