

ITEM FOR PUBLIC WORKS SUBCOMMITTEE OF FINANCE COMMITTEE

HEAD 705 - CIVIL ENGINEERING Environmental Protection – Refuse Disposal 45DR – Restoration of Pillar Point Valley Landfill

Members are invited to recommend to Finance Committee the upgrading of **45DR**, entitled “Restoration of Pillar Point Valley Landfill” to Category A at an estimated cost of \$441.3 million in money-of-the-day prices.

PROBLEM

The Pillar Point Valley Landfill at Tuen Mun was closed in 1996. If not properly restored, it may have adverse environmental impacts and cannot be put to productive use.

PROPOSAL

2. The Director of Environmental Protection (DEP), with the support of the Secretary for the Environment, Transport and Works, proposes to upgrade **45DR** to Category A at an estimated cost of \$441.3 million in money-of-the-day (MOD) prices for the restoration works at the Pillar Point Valley Landfill.

PROJECT SCOPE AND NATURE

3. The scope of the project comprises –

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- (a) design and construction of a landfill gas management system to control gas emission and to prevent off-site gas migration;
- (b) design and construction of a leachate¹ management system to control surface and groundwater infiltration into the landfill and to extract, collect, treat and dispose of the landfill leachate;
- (c) design and construction of an engineered capping layer (with low permeability) and a surface water drainage system;
- (d) improvements to slope stability, landscaping of the landfill and other ancillary works; and
- (e) post-commissioning works for seven years².

The site plan is at Enclosure 1. We plan to start the works in March 2004 for completion in December 2005.

JUSTIFICATION

4. All landfills produce landfill gas and leachate. 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.

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1 "Leachate" is a term used to describe water which has permeated through the waste mass.

2 We need to monitor progress of the restoration works after its commissioning (i.e. after the carrying out of certain performance tests to verify that the landfill facilities meet the performance requirements in the contract), mainly regarding landfill gas migration and leachate pollution. Subject to regular review, the post-commissioning period may last up to 30 years. The proposed landfill gas and leachate management systems will be in operation during this period and require regular environmental control and maintenance.

5. Municipal solid waste, when disposed of at landfills, does not exhibit homogenous geotechnical properties, as it is subject to a continuing biological degradation process. This results in differential settlement of the landfills' surface and may lead to slope instability problems. We therefore need to monitor and improve slope stability at 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.

6. To reduce infiltration of rain water into the waste mass thereby reducing the amount of leachate to be treated, we need to construct a capping layer on top of the surface of landfills. We also need to build a system of surface drains.

7. The Pillar Point Valley Landfill commenced operation in 1983 and has become derelict since its closure in 1996. It is the last of the 13 closed landfills in Hong Kong that has yet to be fully restored. After completion of landfilling activities, the Pillar Point Valley Landfill has only been provided with a temporary soil capping and surface drainage system. It does not have proper landfill gas and leachate management systems. Currently, its landfill gas merely escapes into the atmosphere, while its leachate is discharged into the public foul sewer without prior treatment. We have been monitoring landfill gas migration and leachate flow to minimise any possible environmental problems. So far, there has been no landfill gas migration to nearby developments or pollution to marine water.

8. As in the case of all other closed landfills, we propose to fully restore the Pillar Point Valley Landfill to minimise possible adverse environmental impacts and to put the land to productive use in future. We are exploring feasible options for afteruse and will ensure that the design of the restoration works will not conflict with that of the afteruse purposes. It must, however, be noted that due to ground settlement problems, the site would only be suitable for passive recreational uses, and any proposal involving building of heavy superstructures, imposing heavy loading or modifying the existing landform would not be technically viable. The site would only be available for afteruse after the restoration works have been completed by 2006.

FINANCIAL IMPLICATIONS

9. We estimate the capital cost of the proposed works to be \$441.3 million in MOD prices (see paragraph 10 below), made up as follows –

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	\$ million	
(a) Landfill gas management system	63.2	
(b) Leachate management system	100.0	
(c) Capping layer	45.0	
(d) Drainage system	35.0	
(e) Slope stabilisations, landscaping and ancillary works	97.3	
(f) Post-commissioning works for seven years (see paragraph 12 below) ³	83.3	
(g) Consultants' fees during construction	2.6	
(h) Independent assessor's fees (see paragraph 19 below)	5.0	
(i) Contingencies	43.0	
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Sub-total	474.4	(in September 2002 prices)
(j) Provision for price adjustment	(33.1)	
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Total	441.3	(in MOD prices)
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_____ A breakdown by man-months of the estimates for consultants' fees for the construction stage is at Enclosure 2.

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3 The average annual costs of the post-commissioning work is \$11.9 million and will be paid to the contractor in monthly instalments.

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

Year	\$ million (Sept 2002)	Price Adjustment Factor	\$ million (MOD)
2003 – 2004	0.4	0.94300	0.4
2004 – 2005	112.4	0.93003	104.5
2005 – 2006	246.4	0.93003	229.2
2006 – 2007	43.2	0.93003	40.2
2007 – 2008	13.1	0.93003	12.2
2008 – 2009	13.1	0.93003	12.2
2009 – 2010	13.1	0.93003	12.2
2010 – 2011	13.1	0.93003	12.2
2011 – 2012	13.1	0.93003	12.2
2012 – 2013	6.5	0.93003	6.0
	474.4		441.3

11. We have derived the MOD estimate on the basis of the Government's latest forecasts of trend labour and construction prices for the period 2003 to 2013. We will tender the proposed works in the form of a "design-build-and-operate" (DBO)⁴ contract. The design and construction part of the contract would be on a fixed-price lump-sum basis. The part of the contract involving post-commissioning works will provide for price adjustment as the period will exceed 21 months.

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4 To employ a single contractor to design, build and subsequently operate the facilities will ensure that continuous liability is borne by a single party, and the responsibility to develop and maintain acceptable environmental and safety standards also rests with one party.

12. While the period of operation and maintenance may last more than two decades (could be up to 30 years in some cases), we will carry out a review every five years, starting from commissioning of the restoration works, to determine if the landfill is completely restored and whether further post-commissioning works would be necessary. We will draw up the contract such that it can last up to 30 years, but we will have the right to terminate it or amend its coverage provided we give the contractor advance notice. We will carry out a review after the first five years. We have included \$83.3 million (at September 2002 prices) in the project cost for seven years of post-commissioning works.

13. Assuming that post-commissioning works would be required at the landfill site for 30 years, the life cost of restoring and maintaining the closed landfill will be about \$666 million⁵ (in MOD prices), and the cost per tonne of waste⁶ will be about \$61 (in MOD prices).

14. Separately, we estimate that by early 2006 when the restoration works have been completed, the landfill gas generation rate would be about 2 230 cubic metres per hour (m³/hr). We will require the contractor to utilise the landfill gas on-site to provide electricity and thermal energy for the restoration facilities. We estimate that about 1 500 m³/hr (or 67%) of landfill gas would be used on-site. As the amount of gas generated would decrease gradually over time, we estimate that the generation rate would be reduced to about 1 530 m³/hr by early 2009 and surplus landfill gas⁷ would only be available for about three years (i.e. between 2006 and 2009)⁸. Given the very limited supply of landfill gas, we consider it not cost-effective to build a whole infrastructural network to convey the small amount of surplus gas to power generation plants.

15. We estimate that the annual recurrent expenditure would be about \$1.1 million.

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5 The post-commissioning cost will slightly reduce over time. According to the current estimate, the average annual cost will reduce from \$11.9 million for the first 7 years to \$11.1 million for the 8th to 15th year, and further reduce to \$10.1 million for the 16th to 30th year.

6 The Pillar Point Valley Landfill received 11 million tonnes of waste during its operation period between 1983 and 1996.

7 "Surplus landfill gas" refers to the remaining volume of landfill gas after having been utilised on-site for the restoration facilities.

8 The surplus landfill gas in 2006 and 2009 would be about 730 m³/hr and 30 m³/hr respectively, which could generate electricity for use by about 3 200 and 130 households respectively.

PUBLIC CONSULTATION

16. We consulted the Environment, Hygiene and District Development Committee of the Tuen Mun District Council on 22 November 2002 and the Legislative Council Environmental Affairs Panel on 26 May 2003 on the proposed restoration works for the Pillar Point Valley Landfill. Both the Committee and the Panel supported the works.

ENVIRONMENTAL IMPLICATIONS

17. We completed in April 1995 an initial Environmental Impact Assessment (EIA) study as part of the feasibility study for restoration of Northwest New Territories landfills, including the Pillar Point Valley Landfill. The study indicated that the proposed restoration works would ensure proper control of the emission and off-site migration of landfill gas and leachate. This will ameliorate the environmental conditions of the site and enable it to be put to beneficial use.

18. We also conducted an environmental review in September 2000 for restoration of the Pillar Point Valley Landfill. The review confirmed that no unacceptable environmental impacts would be caused by the proposed restoration works.

19. The future contractor will carry out a detailed EIA study for restoration of the landfill. During the Design and Build part of the contract, we will require the contractor to appoint an independent assessor to ensure that the facilities comply with the contract requirements. We have included \$5 million (at September 2002 prices) in the project cost for employing the independent assessor. During the Build and Operation part of the contract, we will withhold payments to the contractor if there is any non-compliance with the required environmental standards.

20. In addition, we will control dust, noise and site run-off nuisances during construction to within established standards and guidelines through the implementation of mitigation measures in the relevant works contract.

21. We have given due consideration to the need to minimise the generation of construction and demolition (C&D) materials in the project. We will make use of the excavated materials as filling materials on site, thereby eliminating the need for disposing of any public fill. We will require the contractor to submit a waste management plan⁹ and ensure that the day-to-day operations on site comply with the plan. We will also encourage the contractor to use non-timber formwork and recyclable materials for temporary works. We estimate that the project will generate about 136 000 m³ of C&D materials. The contractor will use about 131 000 m³ (96%) on site and dispose of only 5 000 m³ (4%), most of which is non-inert waste, at landfills. The notional cost of accommodating C&D waste at landfill sites is estimated to be \$625,000 for this project (based on a notional unit cost¹⁰ of \$125/m³).

LAND ACQUISITION

22. The project does not require land acquisition.

BACKGROUND INFORMATION

23. We included **45DR** in Category B in August 1990. Finance Committee approved -

- (a) the upgrading of three parts of **45DR** as **154DR**, **155DR** and **156DR** to Category A in June 1995 for implementing the restoration works for Shuen Wan Landfill, Urban Landfills (Jordan Valley, Ma Yau Tong West, Ma Yau Tong Central, Ngau Chi Wan and Sai Tso Wan) and Tseung Kwan O Landfills respectively;
- (b) the upgrading of part of **45DR** as **157DR** to Category A in July 1995 for implementing the restoration works for the Northwest New Territories Landfills (Siu Lang Shui, Ngau Tam Mei and Ma Tso Lung); and

/(c).....

9 The Waste Management Plan would include appropriate mitigation measures, including the allocation of areas for waste segregation on-site to facilitate reuse/recycling of C&D materials.

10 This estimate has taken into account the cost for developing, operating and restoring the landfills after they are filled and the aftercare required. It does not include the land opportunity cost for existing landfill sites (which is estimated at \$90/m³), nor the cost to provide new landfills (which are likely to be more expensive) when the existing ones are filled. The notional cost estimate is for reference only and does not form part of this project estimate.

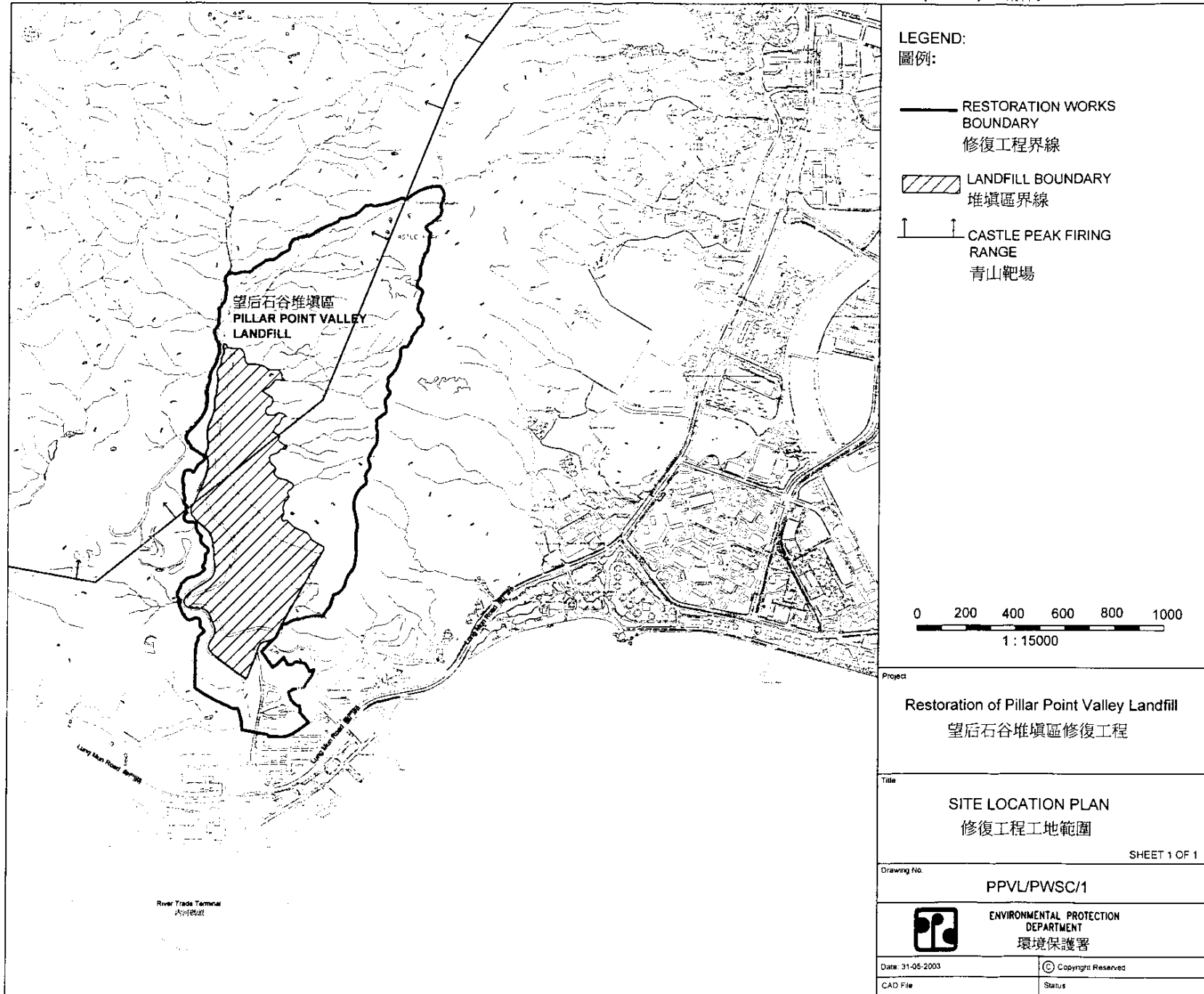
- (c) the upgrading of part of **45DR** as **158DR** to Category A in January 1998 for implementing the restoration works for the Gin Drinkers Bay Landfill under **158DR**.

24. We employed consultants under **59DR** "Restoration of landfill sites – consultants' fees and investigations" in December 1992 to carry out feasibility studies and to develop outline schemes for the restoration of landfill sites including the Pillar Point Valley Landfill. We also employed consultants under **150DR** "Restoration of Shuen Wan Landfill, Tseung Kwan O Landfill and Northwest New Territories Landfills – consultants' fees and investigations" in June 2000 to prepare contract documents and arrange for tender invitation and evaluation for the restoration works.

25. Part of the Pillar Point Valley Landfill lies within the Castle Peak Firing Range under the custody of the Garrison. In 1998, the Garrison gave approval for Government to access the military site for carrying out the restoration and post-commissioning works at the Pillar Point Valley Landfill.

26. We plan to invite tenders for the restoration works at Pillar Point Valley Landfill in August 2003. We will start the restoration works in March 2004 for completion in December 2005.

27. We estimate that the project would create about 87 jobs (22 professional/technical staff and 65 labourers) during the design and build stage, and 21 jobs (seven professional/technical staff and 14 labourers) during the operation stage.



45DR – Restoration of Pillar Point Valley Landfill

Breakdown of the estimates for the consultants' fees

Consultants' staff costs		Estimated man- months	Average MPS* salary point	Multiplier factor	Estimated fee (\$ million)
Consultants' fee for	Professional	21	38	1.6	1.94
construction stage	Technical	21	14	1.6	0.66
Total consultants' staff cost					2.60

*MPS = Master Pay Scale

1. A multiplier factor of 1.6 is applied to the average Master Pay Scale (MPS) point to arrive at the full staff costs including the consultants' overheads and profit, as the staff will be employed in the site offices. (At 1.10.2002, MPS pt. 38 = \$57,730 p.m. and MPS pt. 14 = \$19,510 p.m.)
2. The figures given above are based on estimates prepared by the Director of Environmental Protection. We will only know the actual man-months and actual fees when we have selected the consultant through the usual competitive lump sum fee bid system.