

ITEM FOR PUBLIC WORKS SUBCOMMITTEE OF FINANCE COMMITTEE

HEAD 704 - DRAINAGE

Environmental Protection - Sewerage and sewage treatment

342DS – Tai Po sewage treatment works stage 5 phase 2A - disinfection

Members are invited to recommend to Finance Committee to upgrade **342DS** to Category A at an estimated cost of \$52.7 million in money-of-the-day prices for providing disinfection facilities in the Tai Po sewage treatment works.

PROBLEM

The existing Tai Po sewage treatment works (TPSTW) do not have disinfection facilities.

PROPOSAL

2. The Director of Drainage Services, with the support of the Secretary for the Environment, Transport and Works, proposes to upgrade **342DS** to Category A at an estimated cost of \$52.7 million in money-of-the-day (MOD) prices for providing disinfection facilities in the TPSTW.

PROJECT SCOPE AND NATURE

3. The scope of the proposed works comprises –

- (a) the provision of ultraviolet disinfection facilities; and

/(b)

- (b) ancillary works including power supply systems, control systems, pipeworks, building services installations, fire services installations, lifting appliances and road works.

_____ A site plan showing the proposed works is at Enclosure 1.

4. We plan to start construction in February 2008 and commission the proposed disinfection facilities in March 2010.

JUSTIFICATION

5. The existing Tai Po sewage treatment works (TPSTW) serving the Tai Po district is a secondary treatment plant with a design capacity of 88 000 cubic metres (m³) per day but without disinfection facilities. Treated effluent of the TPSTW is conveyed sequentially by two effluent pumping stations located in Tai Po and Sha Tin to the Kai Tak Nullah for disposal. In view of the continuing population growth and sewerage network expansion in the Tai Po district in recent years, the TPSTW is being further expanded and upgraded under the stage 5 works, of which **342DS** forms a part.

6. The treated effluent from the TPSTW is firstly conveyed to the Sha Tin sewage treatment works (STSTW). The combined Sha Tin and Tai Po effluents are then pumped through a sewage tunnel for discharge into the Kai Tak Nullah. This discharge arrangement has been operating since 1996. The proposed disinfection facilities at the TPSTW have been planned to dovetail with the disinfection programme for the STSTW under another PWP item **276DS** "STSTW Stage 3 extension". The disinfection facilities in the two sewage treatment works will significantly reduce the bacterial level in the treated effluent before it is ultimately discharged into the Kai Tak Nullah, hence improving the water quality.

7. We will adopt ultraviolet irradiation as the disinfection means, which is a proven technology for disinfecting effluent treated at secondary level. At present, the bacterial (*E. coli*) content of the treated effluent of the TPSTW is considerably high (12-month geometric mean of 53 000 counts per 100 millilitres (ml)), as reflected from the wastewater characteristics of the plant as given in Enclosure 2. With the proposed disinfection works commissioned, the bacterial content of the treated effluent will be significantly reduced.¹

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¹ The effluent standard in respect of *E. coli* will be 1 000 counts per 100 ml (monthly geometric mean).

8. The Director of Drainage Services will deploy in-house staff to carry out the design and site supervision. However, due to inadequate in-house expertise in the environmental monitoring and audit aspect, we propose to employ specialist consultants to conduct the environmental monitoring and audit to ensure smooth and effective delivery of the project.

FINANCIAL IMPLICATIONS

9. We estimate the capital cost of the proposed works to be \$52.7 million in MOD prices (see paragraph 10 below), made up as follows –

| | \$ million | |
|--|-------------------|----------------------------|
| (a) Ultraviolet disinfection facilities | 31.1 | |
| (b) Ancillary works | 13.7 | |
| (c) Environmental mitigation measures | 1.0 | |
| (d) Consultants’ fees for environmental monitoring and audit | 1.3 | |
| (e) Contingency | 4.6 | |
| Sub-total | 51.7 | (in September 2006 prices) |
| (f) Provision for price adjustment | 1.0 | |
| Total | 52.7 | (in MOD prices) |

_____ A breakdown of the estimates for the consultants’ fees by man-months is at Enclosure 3.

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

/2008 – 2009

| Year | \$ million (Sept 2006) | Price adjustment factor | \$ million (MOD) |
|-------------|---------------------------|-------------------------------|---------------------|
| 2008 – 2009 | 27.6 | 1.00649 | 27.8 |
| 2009 – 2010 | 10.0 | 1.01656 | 10.2 |
| 2010 – 2011 | 3.8 | 1.02672 | 3.9 |
| 2011 – 2012 | 7.0 | 1.03699 | 7.3 |
| 2012 – 2013 | 3.3 | 1.05514 | 3.5 |
| | 51.7 | | 52.7 |

11. We have derived the MOD estimate on the basis of the Government's latest forecast of the trend rate of change in the prices of the public sector building and construction output for the period from 2008 to 2013. We will implement the works under one contract combining the civil works together with the electrical and mechanical works. We will tender the contract on a re-measurement basis because of uncertain ground conditions. The contract will provide for price adjustment as the contract period will exceed 21 months.

12. We estimate the annual recurrent expenditure arising from the proposed works to be about \$2.4 million.

13. Based on the current level of expenditure on operation and day-to-day maintenance of sewerage facilities, the proposed works will lead to an increase in the recurrent cost of providing sewage services by about 0.14%, which has been taken into account in determining the future sewage charges.

PUBLIC CONSULTATION

14. On 16 March 2007, we consulted the Environment, Housing and Works Committee of the Tai Po District Council on the project and obtained their support for implementing the proposed works.

15. We consulted the Legislative Council Panel on Environmental Affairs on 23 April 2007 on the proposed works. Members indicated support for the proposal to be submitted to Public Works Subcommittee (PWSC) for consideration. Meanwhile, Members requested the Administration to consult green groups on the proposed provision of disinfection facilities at the TPSTW, and to include in the PWSC paper the latest progress of the Towngas Company's proposal for the use of biogas and treated effluent produced at the TPSTW.

16. We have updated the green groups² on the latest proposal of the project and no adverse comments have been received. The position of the Towngas Company's proposal is provided in Enclosure 4.

ENVIRONMENTAL IMPLICATIONS

17. The whole stage 5 works, of which **342DS** forms a part, is a designated project under the Environmental Impact Assessment (EIA) Ordinance. An environmental permit is required for its implementation and operation. On 28 October 2004, the Director of Environmental Protection approved the EIA report of the stage 5 project. The EIA concluded that with the implementation of mitigation measures, the proposed works would not give rise to unacceptable environmental impacts. The provision of UV disinfection facilities will bring about environmental improvement, in terms of better water quality of the treated effluent of the TPSTW. For short-term impacts during construction, we will control noise, dust and site run-off to levels within established standards and guidelines, through the implementation of mitigation measures such as the use of quiet construction plant to reduce noise generation, water-spraying to reduce dust emission and proper pre-treatment of site run-off. We will conduct environmental monitoring and audit to ascertain the effectiveness of the mitigation measures. We have included about \$1.0 million in September 2006 prices in the project estimate for the implementation of environmental mitigation measures.

18. In the planning and design stages, we have considered ways to reduce construction and demolition (C&D) materials where possible. For example, excavation for structures will be minimised as far as practicable. In addition, we will require the contractor to reuse inert C&D materials including excavated soil for

/backfilling

² The contacted green groups are Conservancy Association, Earthcare, Friends of the Earth (HK), Green Peace China, Green Power, Green Student Council, Hong Kong Marine Conservation Society, Tai Po Environmental Association and World Wide Fund for Nature Hong Kong.

backfilling on site or in other suitable construction sites as far as possible, in order to minimise the disposal of C&D materials to public fill reception facilities. We will encourage the contractor to maximise the use of recycled or recyclable C&D materials, as well as the use of non-timber formwork to further minimise the generation of construction waste.

19. We will also require the contractor to submit a waste management plan (WMP) for approval. The WMP will include appropriate mitigation measures to avoid, reduce, reuse and recycle C&D materials. We will ensure that the day-to-day operations on site comply with the approved WMP. We will control the disposal of public fill, C&D materials and C&D waste to public fill reception facilities³ and landfills respectively through a trip-ticket system. We will require the contractor to separate public fill from C&D waste for disposal at appropriate facilities. We will record the disposal, reuse and recycling of C&D materials for monitoring purposes.

20. We estimate that the project will generate about 3 800 tonnes of C&D materials. Of these, we will reuse about 500 tonnes (13%) on site, and deliver 3 100 tonnes (82%) to public fill reception facilities for subsequent reuse. In addition, we will dispose of 200 tonnes (5%) to landfills. The total cost of accommodating C&D materials at public fill reception facilities and landfill sites is estimated to be about \$108,700 for this project (based on a unit cost of \$27/tonne for disposal at public fill reception facilities and \$125/tonne⁴ at landfills.)

LAND ACQUISITION

21. This project does not require any land acquisition.

BACKGROUND INFORMATION

22. The TPSTW is located within the Tai Po Industrial Estate in Tai Po, and has been developed in five stages. Since its completion in 1979, stage 1 has

/been

³ Public fill reception facilities are specified in Schedule 4 of the Waste Disposal (Charges for Disposal of Construction Waste) Regulation. Disposal of public fill in public fill reception facilities requires a licence issued by the Director of Civil Engineering and Development.

⁴ The 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 is likely to be more expensive) when the existing ones are filled.

been providing secondary sewage treatment. In 1982, we commissioned the stage 2 extension, consisting of the expansion of the stage 1 treatment facilities and the installation of sludge treatment facilities. The combined design capacity of the plant under the stages 1 and 2 was 33 600 m³ per day.

23. The next two stages of extension, commissioned in 1986 and 1995 respectively, provided an additional capacity of 54 400 m³ per day, bringing the overall designed plant capacity to 88 000 m³ per day.

24. We have been implementing the stage 5 works in phases, namely phases 1, 2A and 2B, to cope with the progressive increase in sewage flow to the TPSTW due to the population growth and sewerage network expansion in the Tai Po area. In May 2005 we started the construction of the TPSTW, stage 5 phase 1 under **222DS** with an estimated cost of \$463.3 million. It will increase the design capacity of the TPSTW from 88 000 m³ per day to 100 000 m³ per day, and is scheduled for completion by the end of 2009.

25. We upgraded **342DS** to Category B in September 2005.

26. The remaining stage 5 phase 2B works, under **236DS**, aim at further increasing the treatment capacity of the TPSTW to 120 000 m³ per day and are in the planning and design stage.

27. The proposed works will not involve any tree removal or planting proposal.

28. We estimate that the works will create some 18 jobs (14 for labourers and another four for professional/technical staff) providing a total employment of 400 man-months.

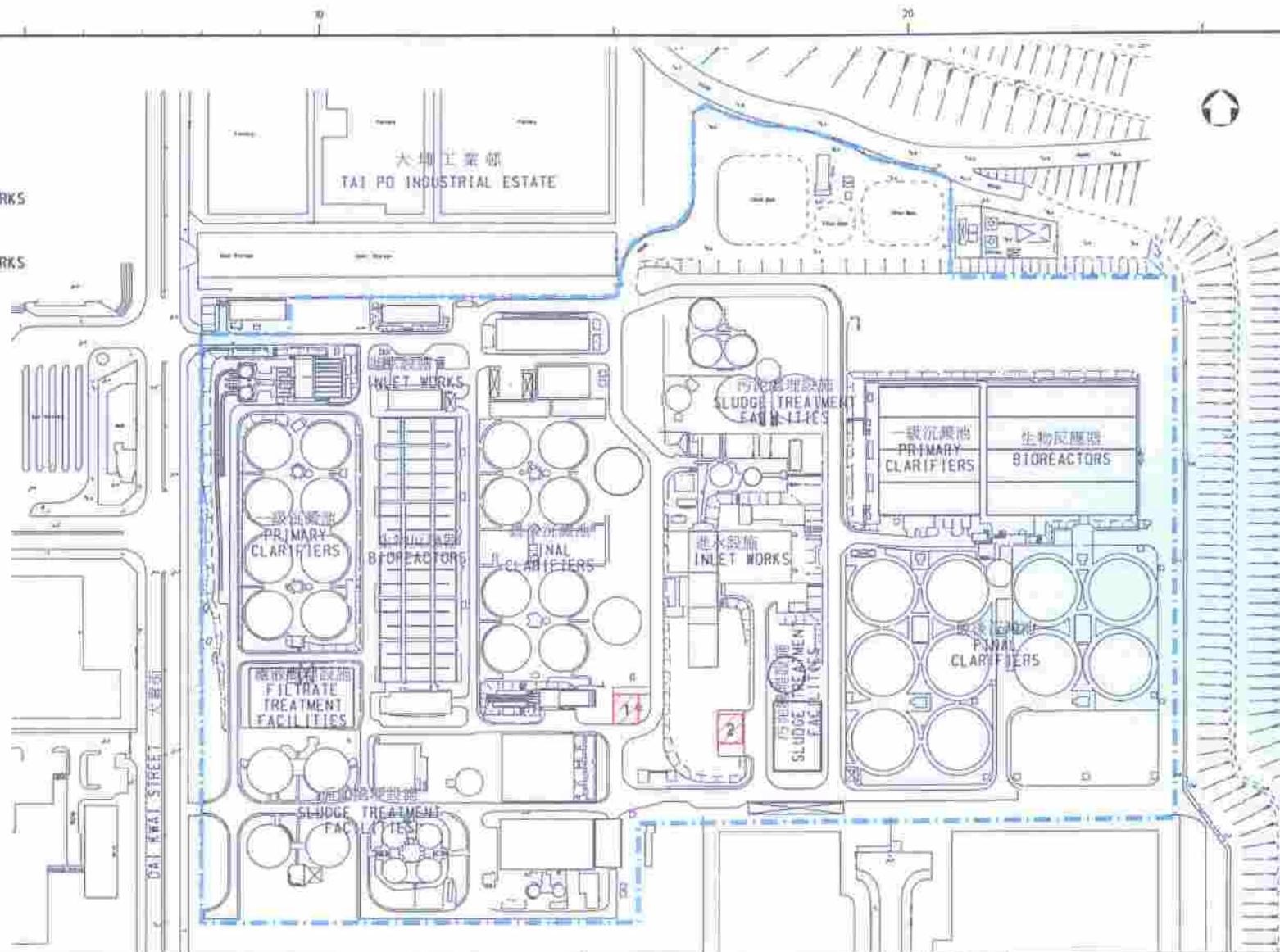
圖例
LEGEND

 第5階段第2A期工程
STAGE 5 PHASE 2A WORKS

 大埔污水處理廠範圍
EXTENT OF TAI PO SEWAGE TREATMENT WORKS

1. 紫外光消毒設施
ULTRAVIOLET DISINFECTION FACILITIES

2. 變電房
TRANSFORMER HOUSE



PROVISIONAL
SUBJECT TO AMENDMENT

圖樣名稱 drawing title

工務計劃項目第 4342DS 號
PWP ITEM NO. 4342DS
大埔污水處理廠第 5 階段第 2A 期工程 - 消毒設施
TAI PO SEWAGE TREATMENT WORKS STAGE 5 PHASE 2A -
DISINFECTION

繪圖 drawn SIGNED Y.W. YIP 日期 date 22.03.2007
核對 checked SIGNED Ir T.K. LIU 日期 date 22.03.2007
批准 approved SIGNED Ir H.S. KAN 日期 date 22.03.2007

部門 office 污水工程部
SEWERAGE PROJECTS DIVISION

圖樣編號 drawing no. 比例 scale
DDN/342DS1/8015 GRAPHIMATIC

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ENCLOSURE 1 頁 1 共 1

Tai Po Sewage Treatment Works
Characteristics of Raw Sewage Influent and Treated Effluent (Existing)

| Parameter | Raw Sewage Influent | Treated Effluent |
|---------------------------------|-------------------------------|----------------------|
| Biochemical Oxygen Demand (BOD) | 196 mg/L | 5 mg/L |
| Total Suspended Solids (TSS) | 383 mg/L | 8 mg/L |
| Nitrogen | 49 mg/L | 8 mg/L |
| <i>E. coli</i> | 10 ⁷ counts/100 mL | 53 000 counts/100 mL |

Notes:

1. The figures in the table are 12-month measured average values unless otherwise specified.
2. The Nitrogen figures for raw sewage influent and treated effluent are Total Kjeldahl Nitrogen and Total Nitrogen respectively.
3. The *E. coli* figure for raw sewage influent is the design value, and that for treated effluent is a 12-month geometric mean value.

Enclosure 3 to PWSC(2007-08)19

342DS – Tai Po Sewage Treatment Works Stage 5 Phase 2A - disinfection

Breakdown of estimates for consultants' costs

| Consultants' staff costs | | Estimated man- months | Average MPS* salary point | Multiplier (Note 1) | Estimated fee (\$ million) |
|---|--------------|--------------------------------------|--|--------------------------------|---|
| Environmental monitoring and audit | Professional | 6 | 38 | 2.0 | 0.7 |
| | Technical | 18 | 14 | 2.0 | 0.6 |
| Total consultants' staff costs (Note 2) | | | | | <hr/> 1.3 <hr/> |

* MPS = Master Pay Scale

Notes

1. A multiplier of 2.0 is applied to the average MPS point to arrive at the full staff costs including the consultant's overheads and profit, as the staff will be employed in the consultant's offices. (As at 1 January 2007, MPS Point 38 = \$54,255 per month and MPS Point 14 = \$18,010 per month).
2. The consultants' staff costs include supervision of environmental monitoring works.
3. We will only know the actual man months and actual fees when we have selected the consultant through the usual competitive fee bid system.

**Brief Account of Towngas Company's Proposal for
Use of Biogas and Treated Effluent Produced at TPSTW**

A preliminary proposal was received from the Hong Kong and China Gas Co. Ltd. (Towngas Company) for utilising a small quantity of effluent (about 3 400 m³ per day) and biogas (about 3 800 m³ per day) generated from the TPSTW for gas production. The proposal requires an area of 1 240 m² within the TPSTW to be provided for the Towngas Company to accommodate an effluent treatment plant, an electricity generation plant and associated pipework. Taking account of its capital investment and maintenance cost for the facilities, the Towngas Company may consider paying a nominal sum for consuming the biogas and effluent inclusive of using the land within the TPSTW. The Government is considering the proposal in conjunction with the ongoing study on formulation of long-term strategy on Total Water Management for completion in early 2008. The cost benefit of the Towngas Company's proposal is being evaluated in comparison with the alternative option of the Drainage Services Department fully utilising the surplus biogas for its own electricity generation for the TPSTW. Given the small quantity of effluent involved, the Towngas Company's proposal, whether accepted or not, would not reduce the need to expand the TPSTW to cope with the increasing sewage inflow.