For discussion on 15 March 2019

Legislative Council Panel on Transport

Replacement of Traffic Control and Surveillance Systems and Other Equipment in Government Tunnels

PURPOSE

This paper seeks Members' views on our proposal to replace the traffic control and surveillance systems ("TCSS") and other equipment in government tunnels, with a view to making a funding application to the Legislative Council Finance Committee ("FC").

PROPOSAL

2. We propose the creation of four new commitments for replacement works as follows -

- (a) \$108,600,000 for replacement of TCSS and radio communication system in the Aberdeen Tunnel;
- (b) \$184,470,000 for replacement of TCSS in the Tate's Cairn Tunnel;
- (c) \$10,253,000 for replacement of the lane control signals and variable aspect signs of TCSS in the Tseung Kwan O Tunnel; and
- (d) \$13,900,000 for replacement of the PABX systems in the Eastern Harbour Crossing, Lion Rock Tunnel, Shing Mun Tunnels and Cross-Harbour Tunnel.

3. Details of the above proposals, including justifications, financial implications, implementation plans and background, are at **Annexes 1 to 4** respectively.

WAY FORWARD

4. We plan to seek the FC's funding approval as soon as practicable for early commencement of the relevant replacement works.

ADVICE SOUGHT

5. Members are invited to provide views on the proposals.

Transport and Housing Bureau Transport Department March 2019

Replacement of Traffic Control and Surveillance System and Radio Communication System in the Aberdeen Tunnel

The traffic control and surveillance system ("TCSS") in the Aberdeen Tunnel ("ABT") is to ensure the safe and effective operation of the tunnel. TCSS consists of a number of sub-systems and is mainly used for traffic management and monitoring. We propose to replace its central control system and certain sub-systems, including the lane control signals and variable message signs under the traffic control system, as well as the closed circuit television ("CCTV") system and automatic incident detection system under the traffic surveillance system. Besides, the radio communication system ("RCS") in the ABT enables communication among tunnel staff within the tunnel control area and control room through walkie-talkies, thereby facilitating tunnel operation.

JUSTIFICATIONS

2. The ABT connects Wong Chuk Hang Road and Wong Nai Chung Gap Flyover in Happy Valley with a total length of 1.99 km. The existing RCS and TCSS in the ABT commenced operation in 2001 and 2005 respectively. The RCS as well as the central control system and certain sub-systems of TCSS are ageing, increasing the risk of system malfunction, which may lead to traffic congestion on Hong Kong Island in case of failure to monitor and co-ordinate traffic effectively. Besides, since the equipment and components of these systems have become obsolete, it is increasingly difficult to procure the required spare parts in the market for repairing the ageing equipment. As such, we consider it necessary to replace the above systems to ensure the continued operation of the tunnel in a safe and effective manner.

3. The new central control system will be a fully computerised system which integrates various tunnel traffic management functions on a single platform. It will also be capable of implementing more programmed traffic management schemes for enhancing operational efficiency. To cope with

prevailing traffic conditions, the new traffic control system will feature enhanced capability in controlling remote traffic message signs, traffic signs and other field equipment. The new traffic surveillance system will have digital cameras and monitors for providing clearer images for more effective traffic monitoring, with more cameras to be erected on the approach roads to enhance traffic monitoring and management efficiency within the tunnel area. The new automatic incident detection system will use image processing techniques to detect vehicles which have stopped inside the tunnel tube due to traffic incidents and alert the control room correspondingly. It also has enhanced capability in identifying prevailing traffic situations (e.g. smoke detection inside the tunnel tube).

FINANCIAL IMPLICATIONS

Capital Expenditure

4. We estimate that the replacement of TCSS and RCS in the ABT will incur a total capital expenditure of \$108,600,000. The breakdown is as follows -

			\$'000
(a)	Repl ABT	acement of TCSS and RCS in the	86,190
	(i)	Central control system	19,700
	(ii)	Traffic control system (including variable message signs, lane control signals, etc.)	12,000
	(iii)	Trafficsurveillancesystem(including CCTV system, automaticincident detection system, etc.)	11,450
	(iv)	Data communication network	6,040
	(v)	Radio communication system	1,000
	(vi)	Associated civil engineering and building services works, engaging relevant engineering consultants, cables and accessories	36,000

\$'000
ng 13,790 nt
8,620
108,600

5. On paragraph 4(a) above, the estimated expenditure of \$86,190,000 will cover the supply and installation of the new TCSS and RCS, including the central control system, CCTV system, automatic incident detection system, lane control signals and remote-controlled traffic signs, variable message signs, traffic lights, various field equipment (e.g. over-height vehicle detectors), computer hardware and software, data communication network, RCS and the associated cables and accessories; building services works for the traffic control room and replacement works for associated control facilities, together with the dismantling and removal of old equipment; and the removal and reinstatement of tunnel wall panels.

6. On paragraph 4(b) above, the estimated expenditure of \$13,790,000 is for meeting the charges for management of the project by the EMSTF, which include carrying out the feasibility study on different proposals; preparing the system specifications, design and project programme; preparing tender documents; tendering and selecting contractor, and engaging relevant engineering consultants; supervising, inspecting, installing, testing and commissioning of the system; and monitoring the operation of the system and rectification work within the defects liability period.

7. On paragraph 4(c) above, the estimated expenditure of \$8,620,000 is for contingency use, which is about 10% of the expenditure under paragraph 4(a) above.

8. The estimated cash flow is as follows -

Financial Year	\$'000
2019-20	1,100

Financial Year		\$'000
2020-21		3,500
2021-22		7,500
2022-23		8,000
2023-24		29,190
2024-25		59,310
	Total	108,600

Recurrent Expenditure

9. The recurrent expenditure of the above proposed system replacement will constitute about \$4,800,000 of the overall management fee payable annually to the operator for the management, operation and maintenance of the ABT. The said amount of recurrent expenditure is broadly the same as that for the existing system. No additional recurrent expenditure will be incurred by the replacement of the system.

IMPLEMENTATION PLAN

10. Subject to FC's funding approval in the fourth quarter of 2019, we propose to implement the proposal according to the following timetable -

Task		Target Completion Date	
(a)	Site investigation (selecting and engaging engineering consultants, conducting cable duct survey and underground utilities investigation; studying and modifying the number and location of field equipment, etc.)	February 2021	
(b)	Preparation of tender documents	September 2021	
(c)	Tendering and selection of contractor	April 2022	
(d)	System design by contractor	October 2022	

	Task	Target Completion Date
(e)	Procurement and installation of associated equipment	January 2024
(f)	Testing, commissioning and changeover of system	May 2024

11. During the implementation of the project, we will minimise the impact on traffic as far as possible. All the installation work will be arranged to be carried out during non-peak hours such that the tunnel operation will not be affected.

BACKGROUND

12. The operation, management and maintenance of the ABT are undertaken by an operator engaged by the Government through open tender. The Transport Department, in consultation with the EMSTF, is responsible for the timely replacement of major tunnel systems to ensure the safe, reliable and efficient operation of the tunnel.

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Replacement of Traffic Control and Surveillance System in the Tate's Cairn Tunnel

The traffic control and surveillance system ("TCSS") in the Tate's Cairn Tunnel ("TCT") is to ensure the safe and effective operation of the tunnel. TCSS consists of a number of sub-systems and is mainly used for traffic management and monitoring. We propose to replace its central control system and certain sub-systems, including the lane control signals and variable message signs under the traffic control system, as well as the closed circuit television ("CCTV") system, automatic incident detection system and environmental monitoring system under the traffic surveillance system.

JUSTIFICATIONS

2. The TCT connects Sha Tin and Diamond Hill with a total length of 3.95 km. It is one of the major traffic links between the New Territories and Kowloon East. The existing TCSS in the TCT commenced operation when the tunnel was commissioned in 1991. An operator was engaged to manage the TCT upon the Government's take-over of the ownership of the tunnel on 11 The central control system and certain sub-systems of TCSS are July 2018. ageing, increasing the risk of system malfunction, which may lead to traffic congestion on the trunk roads in Sha Tin and Kowloon East in case of failure to monitor and co-ordinate traffic effectively. Besides, since the equipment and components of the systems have become obsolete, it is increasingly difficult to procure the required spare parts in the market for repairing the ageing equipment. As such, we consider it necessary to replace the system to ensure the continued operation of the tunnel in a safe and effective manner.

3. The new central control system will be a fully computerised system which integrates various tunnel traffic management functions on a single platform. It is also capable of implementing more programmed traffic management schemes for enhancing operational efficiency. To cope with prevailing traffic conditions, the new traffic control system will feature

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enhanced capability in controlling remote traffic message signs, traffic signs and other field equipment. The new traffic surveillance system will have digital cameras and monitors for providing clearer images for more effective traffic monitoring, with more cameras to be erected on the approach roads to enhance traffic monitoring and management efficiency within the tunnel area. The new automatic incident detection system will use image processing techniques to detect vehicles which have stopped inside the tunnel tube due to traffic incidents and alert the control room correspondingly. It also has enhanced capability in identifying prevailing traffic situations (e.g. smoke detection inside the tunnel tube). In addition, the environmental monitoring system will also be replaced to monitor the pollutants and visibility level in the tunnel tube to ensure compliance with standards stipulated by the Environmental Protection Department.

FINANCIAL IMPLICATIONS

Capital Expenditure

4. We estimate that the replacement of TCSS in the TCT will incur a total capital expenditure of \$184,470,000. The breakdown is as follows -

\$'000

(a)	Replacement of TCSS in the TCT			
	(i)	Central control system	20,000	
	(ii)	Traffic control system (including variable message signs, lane control signals, etc.)	33,700	
	(iii)	Trafficsurveillancesystem(includingCCTV system, automaticincidentdetectionsystem,environmentalmonitoringsystem,etc.)	27,500	
	(iv)	Data communication network	19,200	

\$'000

	(v) Associated civil engineering and 46,00	0
	building services works, engaging relevant engineering consultants, cables and accessories	
(b)	Electrical and Mechanical Services Trading Fund ("EMSTF") project management charges	23,420
(c)	Contingency (about 10% of item (a) above)	14,650
	Total	184,470

5. On paragraph 4(a) above, the estimated expenditure of \$146,400,000 will cover the supply and installation of the new TCSS, including the central control system, CCTV system, automatic incident detection system, lane control signals and remote-controlled traffic signs, variable message signs, traffic lights, various field equipment (e.g. over-height vehicle detectors), environmental monitoring system, computer hardware and software, data communication network, the associated cables and accessories, etc.; building services works for traffic control room and replacement works for associated control facilities, together with the dismantling and removal of old equipment; and the removal and reinstatement of tunnel wall panels.

6. On paragraph 4(b) above, the estimated expenditure of \$23,420,000 is for meeting the charges of management of the project by the EMSTF, which includes carrying out the feasibility study on different proposals; preparing the system specifications, design and project programme; preparing tender documents, tendering and selecting contractor, and engaging relevant engineering consultants; supervising, inspecting, installing, testing and commissioning of the system; and monitoring the operation of the system and rectification work within the defects liability period.

7. On paragraph 4(c) above, the estimated expenditure of \$14,650,000 is for contingency use, which is about 10% of the expenditure underparagraph 4(a) above.

The estimated cash flow is as follows -

Financial Year	\$'000
2019-20	3,000
2020-21	4,000
2021-22	9,700
2022-23	12,000
2023-24	54,150
2024-25	101,620
Total	184,470

Recurrent Expenditure

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9. The recurrent expenditure of the above proposed system replacement will constitute about \$4,700,000 of the overall management fee payable annually to the operator for the management, operation and maintenance of the TCT. The said amount of the recurrent expenditure is broadly the same as that for the existing system. No additional recurrent expenditure will be incurred by the replacement of the system.

IMPLEMENTATION PLAN

10. Subject to the FC's funding approval in the fourth quarter of 2019, we plan to implement the proposal according to the following timetable -

Task

Target Completion Date

February 2021

 (a) Site investigation (such as selection and engaging engineering consultants, conducting cable duct survey and underground utilities investigation; studying and modifying the number and location of field equipment, etc.)

(b)	Preparation of tender documents	September 2021
(c)	Tendering and selection of contractor	April 2022
(d)	System design by contractor	October 2022
(e)	Procurement and installation of associated equipment	January 2024
(f)	Testing, commissioning and changeover of system	May 2024

11. During the implementation of the project, we will minimise the impact on traffic as far as possible. All the installation work will be arranged to be carried out during non-peak hours such that the tunnel operation will not be affected.

BACKGROUND

12. The operation, management and maintenance of the TCT are undertaken by an operator engaged by the Government through open tender. The Transport Department, in consultation with the EMSTF, is responsible for the timely replacement of major tunnel systems to ensure the safe, reliable and effective operation of the tunnel.

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Replacement of Lane Control Signals and Variable Aspect Signs of the Traffic Control and Surveillance System <u>in the Tseung Kwan O Tunnel</u>

The traffic control and surveillance system ("TCSS") in the Tseung Kwan O Tunnel ("TKOT") consists of a number of sub-systems. We propose to replace the lane control signals and variable aspect signs under the traffic control system of TCSS, including lane control signals inside the tunnel, speed limit signs, tunnel control signs, etc., primarily used for traffic management.

JUSTIFICATIONS

2. The TKOT connects Kwun Tong and Tseung Kwan O with a total length of 0.9 km. The existing in-tunnel lane control signals and variable aspect signs of TCSS (including the variable speed limit signs and "tunnel closed" signs) in the TKOT commenced operation when the tunnel was commissioned in 1990. Such equipment is ageing, increasing the risk of system malfunction, which may lead to traffic accidents and congestion on the major road networks on both sides of the tunnel in case of failure to disseminate appropriate traffic control information to motorists. Besides, since the equipment and components of the systems have become obsolete, it is increasingly difficult to procure the required spare parts in the market for repairing the ageing equipment. As such, we consider it necessary to replace the equipment to ensure the continued operation of the tunnel in a safe and effective manner.

3. We will procure new Light Emitting Diode ("LED") type lane control signals and variable speed limit signs, which have significantly wider viewing angle and are much brighter. They will provide a clearer display of signals and information to motorists. Besides, LED displays will consume less electricity, have a longer serviceable life and are more reliable. Hence, they will be more environmental-friendly than the existing equipment.

FINANCIAL IMPLICATIONS

Capital Expenditure

4. We estimate that the replacement of the lane control signals and variable aspect signs of TCSS in the TKOT will incur a total capital expenditure of \$10,253,000. The breakdown is as follows -

		\$'00	0
(a)	Replacement of the in-tunnel lane control signals and variable aspect signs of the TCSS in TKOT		8,140
	(i) In-tunnel lane control signals	4,000	
	(ii) Variable aspect signs	4,140	
(b)	Electrical and Mechanical Services Trading Fund ("EMSTF") project management charges		1,300
(c)	Contingency (about 10% of item (a) above)		813
	Total		10,253

5. On paragraph 4(a) above, the estimated expenditure of \$8,140,000 will cover the replacement of the lane control signals and variable aspect signs in the tunnel, including dismantling and disposal of the existing signs; and the supply, installation, testing and commissioning of the new signals and signs with associated local controller, interface equipment and accessories.

6. On paragraph 4(b) above, the estimated expenditure of \$1,300,000 is for meeting the charges of management of the project by the EMSTF, which includes carrying out the feasibility study on different proposals; preparing the system specifications, design and project programme; preparing tender documents; tendering and selecting contractor; supervising, inspecting, installing, testing and commissioning of the system; and monitoring the operation of the system and rectification work within the defects liability period.

7. On paragraph 4(c) above, the estimated expenditure of \$813,000 is for contingency use, which is about 10% of the expenditure under paragraph 4(a) above.

8.	The estimated	cash flow	is as follows -

Financial Yea	ar	\$'000
2019-20		300
2020-21		350
2021-22		1,939
2022-23		4,600
2023-24		3,064
r	Fotal	10,253

Recurrent Expenditure

9. The recurrent expenditure of the above proposed system replacement will constitute about \$115,000 of the overall management fee payable annually to the operator for the management, operation and maintenance of the TKOT. The said amount of the recurrent expenditure is broadly the same as that for the existing equipment. No additional recurrent expenditure will be incurred by the replacement of equipment.

IMPLEMENTATION PLAN

10. Subject to the FC's funding approval in the fourth quarter of 2019, we plan to implement the proposal according to the following timetable -

	Task	Target Completion Date
(a)	Site investigation	September 2020
(b)	Preparation of tender documents	February 2021
(c)	Tendering and selection of contractor	October 2021
(d)	System design by contractor	February 2022

	Task	Target Completion Date
(e)	Procurement and installation of associated equipment	February 2023
(f)	Testing, commissioning and changeover of equipment	May 2023

11. During the implementation of the project, we will minimise the impact on traffic as far as possible. All the installation work will be arranged to be carried out during non-peak hours such that the tunnel operation will not be affected.

BACKGROUND

12. The operation, management and maintenance of the TKOT are undertaken by an operator engaged by the Government through open tender. The Transport Department, in consultation with the EMSTF, is responsible for the timely replacement of major tunnel systems to ensure safe, reliable and effective operation of the tunnel.

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Replacement of PABX Systems in the Eastern Harbour Crossing, Lion Rock Tunnel, Shing Mun Tunnels and Cross-Harbour Tunnel

The PABX system, an automatic telephone switching system capable of centralised processing of telephone extensions and fax lines within the tunnel area, enables the operators engaged for the operation, management and maintenance of the tunnels to maintain communication with the Hong Kong Police Force ("HKPF"), Fire Services Department ("FSD"), and other regulatory government departments such as the Transport Department ("TD"), and Electrical and Mechanical Services Department, as well as other tunnel operators and outside parties. The PABX system is crucial to the external communication and co-ordination in relation to the operation of tunnels.

JUSTIFICATIONS

2. The existing PABX system of the Eastern Harbour Crossing ("EHC") has been in use for nearly 30 years since 1989, whereas those of the Lion Rock Tunnel ("LRT"), Shing Mun Tunnels ("SMTs") and Cross-Harbour Tunnel ("CHT") have been in use for more than 23 years since their last replacement in 1995 (for the LRT) and 1990 (for the SMTs and CHT) respectively. The above systems are ageing, increasing the risk of malfunction. Since the equipment and components of the systems have become obsolete, it is increasingly difficult to procure the required spare parts in the market for repairing the ageing equipment. To maintain prompt and effective communication and co-ordination among tunnel staff, government departments or other tunnel control centres, and to facilitate liaison with the HKPF, FSD and TD's Emergency Transport Co-ordination Centre during emergencies in particular, we consider it necessary to replace those PABX systems to ensure the continued operation of the tunnels in a safe and effective manner.

3. The new systems will connect the intercoms of the administration buildings, tunnel tubes, tunnel portal facilities and ventilation buildings to certain telephone lines of public telephone exchanges. Subject to the operational needs of the respective tunnels, the new systems will provide appropriate telecommunication features (e.g. control room direct lines, etc.) so as to facilitate the operation, management and maintenance work of tunnel operators and the operation of regulatory government departments. For traffic management and incident handling, the new systems will also provide dedicated telephones for urgent / instant communication among the tunnel operators.

FINANCIAL IMPLICATIONS

Capital Expenditure

4. We estimate that the replacement of the PABX systems in the EHC, LRT, SMTs and CHT will incur a total capital expenditure of \$13,900,000. The breakdown is as follows -

		\$'00)0
(a)	Replacement of the PABX system EHC	n in the	3,310
	(i) Central system (e.g. central pr unit, interface cards)	cocessing 1,700	
	(ii) Associated cable distribution telephone sets and accessories	systems, 1,610	
(b)	Replacement of the PABX system LRT	n in the	2,206
	(i) Central system (e.g. central pr unit, interface cards)	cocessing 1,100	
	(ii) Associated cable distribution telephone sets and accessories	systems, 1,106	
(c)	Replacement of the PABX system SMTs	n in the	2,816
	(i) Central system (e.g. central pr unit, interface cards)	cocessing 1,400	
	(ii) Associated cable distribution telephone sets and accessories	systems, 1,416	
(d)	Replacement of the PABX system CHT	n in the	2,700

			\$'000	I
	(i)	Central system (e.g. central processing unit, interface cards)	1,400	
	(ii)	Associated cable distribution systems, telephone sets and accessories	1,300	
			(a) to (d)	11,032
(e)	Elec Fun char	etrical and Mechanical Services Trading d ("EMSTF") project management eges		1,765
(f)	Con aboy	tingency (about 10% of items (a) to (d) we)		1,103
		Total		13,900

5. On paragraphs 4(a) to (d) above, the estimated expenditure of \$11,032,000 will cover the supply and installation of the new PABX systems (including the telephone sets), and the dismantling and removal of old equipment.

6. On paragraph 4(e) above, the estimated expenditure of \$1,765,000 is for meeting the charges for management of the project by the EMSTF, which includes carrying out the feasibility study on different proposals; preparing the system specifications, design and project programme; preparing tender documents; tendering and selecting contractor; supervising, inspecting, installing, testing and commissioning of the system; and monitoring the operation of the system and rectification work within the defects liability period.

7. On paragraph 4(f) above, the estimated expenditure of \$1,103,000 is for contingency use, which is about 10% of the expenditure under paragraphs 4(a) to (d) above.

8. The estimated cash flow is as follows -

Financial Year	\$'000
2019-20	400
2020-21	900
2021-22	3,310

Financial Year	ſ	\$'000
2022-23		6,700
2023-24		2,590
	Total	13,900

Recurrent Expenditure

9. The recurrent expenditure of the above proposed replacement of the systems will constitute \$104,000 of the overall management fees payable annually to the operators for the management, operation and maintenance of the tunnels. The said amount of the recurrent expenditure is broadly the same as that for the existing systems. No additional recurrent expenditure will be incurred by the replacement of the systems.

IMPLEMENTATION PLAN

10. Subject to the FC's funding approval in the fourth quarter of 2019, we plan to implement the proposal according to the following timetable -

	Task	Target Completion Date
(a)	Site investigation	September 2020
(b)	Preparation of tender documents	February 2021
(c)	Tendering and selection of contractor	November 2021
(d)	System design by contractor	February 2022
(e)	Procurement and installation of associated equipment	April 2023
(f)	Testing, commissioning and changeover of system	May 2023

11. During the implementation of the project, we will minimise the impact on the daily operation, management and maintenance of the tunnels as far as practicable. All the installation work will be arranged to be carried out

during non-peak hours such that the tunnel operation will not be affected.

BACKGROUND

12. The operation, management and maintenance of the EHC, LRT, SMTs and CHT are undertaken by operators engaged by the Government through open tender. The TD, in consultation with the EMSTF, is responsible for the timely replacement of major tunnel systems to ensure safe, reliable and effective operation of the tunnels.

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