12. OVERALL CONCLUSIONS

12.1.1 This EIA Report has assessed the potential environmental impacts associated with the construction and operation of the proposed Route 16 Alternative Alignment, in accordance with the requirements in the Study Brief and EIA Ordinance. Environmental issues including air quality, noise, waste management, water quality, ecology, hazard, landscape & visual and cultural heritage have been assessed in the report. The findings of the report indicate that with the implementation of the recommended mitigation measures, the proposed Route 16 Alternative Alignment will comply with the established environmental criteria.

12.1.2 Table 12.1a presents the environmental implementation schedule of the Project. The recommended environmental monitoring and audit (EM&A) requirements will ensure the efficacy of the environmental control measures and compliance with environmental standards as detailed in a separate EM&A Manual.

Table 12.1a Implementation Schedule of Environmental Mitigation Measures and Key EM&A Requirements

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
Air Quality							
Construction Dust	3.5.3	2.9.2	Any excavated dusty materials or stockpile of dusty material shall be covered entirely by impervious sheeting or sprayed with water so as to maintain the entire surface wet	whole site	all times	The Contractor	APCR, LS2, Part II, 9
	3.5.3	2.9.2	A stockpile of dusty materials shall not extend beyond the pedestrian barriers, fencing or traffic cones	whole site	all times	The Contractor	APCR, LS2, Part II, 9
	3.5.3	2.9.2	Vehicle washing facilities shall be provided at every exit point	entrance or exit of the site	all times	The Contractor	APCR, LS2, Part III, 13
	3.5.3	2.9.2	The area where vehicle washing takes place and the section of the road between the washing facilities and the exit point shall be paved with concrete, bituminous materials or hardcores	entrance or exit of the site	all times	The Contractor	APCR, LS2, Part III, 14
	3.5.3	2.9.2	Where a site boundary adjoins a road, street, services lane or other area accessible to the public, hoarding of not less than 2.4 m high from ground level shall be provided along the entire length of that portion of the site boundary except for a site entrance or exit	whole site	all times	The Contractor	APCR, LS2, Part III, 13
	3.5.3	2.9.2	Every main haul road shall be sprayed with water or a dust suppression chemical so as to maintain the entire road surface wet	whole site	all times	The Contractor	APCR, LS2, Part III, 14
	3.5.3	2.9.2	The portion of any road leading only to a construction site that is with 30 m of a discernible or designated vehicle entrance or exit shall be kept clear of dusty materials	whole site	all times	The Contractor	APCR, LS2, Part III, 14
	3.5.3	2.9.2	Any stockpile of dusty materials shall be either covered entirely be impervious sheeting, placed in an area sheltered on the top and the 3 sides or sprayed with water or a dust suppression chemical so as to maintain	whole site	all times	The Contractor	APCR, LS2, Part IV, 18

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
			the entire surface wet				
	3.5.3	2.9.2	All dusty materials shall be sprayed with water or a dust suppression chemical immediately prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet	whole site	all times	The Contractor	APCR, LS2, Part IV, 19
	3.5.3	2.9.2	Every vehicle shall be washed to remove any dusty materials from its body and wheels immediately before leaving a construction site	entrance or exit of site	all times	The Contractor	APCR, LS2, Part IV, 21
	3.5.3	2.9.2	The working area of any excavation shall be sprayed with water or a dust suppression chemical immediately before, during and immediately after the operation so as to maintain the entire surface wet	whole site	all times	The Contractor	APCR, LS2, Part IV, 24
	3.5.4	2.9.2	Dust monitoring station shall be set up for the EM&A to ensure the dusty impact is within the criteria at the nearby ASRs	Government Quarter at Butterfly Valley (AM1) and Lai Chi Kok Indoor Centre (AM2)	all times	ET	-
Tunnel Air Quality	3.6.5	2.12	Air monitoring for the tunnel air quality shall be required to ensure the acceptability of the air quality criteria	At Eagle's Nest Tunnel	all times	The Tunnel Operator	Practice Note on Control of Air Pollution in Vehicle Tunnel, Nov/95
Noise							
Construction noise	4.5.4.5, 4.5.4.16, 4.5.4.24 & Table 4.5m	3.8.3, 3.8.4, 3.8.5 & Table 3.8a	Use of quiet PME, reducing the number of each type of PME to one and movable noise barriers located close to concrete lorry mixer, concrete pump, generator, air compressor and poker vibrator If the construction activities is within 40m of LCK Reception Centre, restrict the use of two noisy PME at any one time	LCK viaduct - substructure	all times	The Contractor	

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
	4.5.4.5, 4.5.4.16 & Table 4.5m	3.8.3, 3.8.4 & Table 3.8a	Use of quiet PME and reducing the number of each type of PME to one If the construction activities is within 40m of LCK Reception Centre, use of movable noise barrier located close to mobile crane	LCK viaduct - superstructure	all times	The Contractor	
	4.5.4.5, 4.5.4.16 & Table 4.5m	3.8.3, 3.8.4 & Table 3.8a	Use of quiet PME and reducing the number of each type of PME to one	LCK viaduct - road pavement	all times	The Contractor	
	4.5.4.5 & Table 4.5m	3.8.3 & Table 3.8a	Use of quiet PME	Ching Cheung Road slip - substructure	all times	The Contractor	
	4.5.4.5 & Table 4.5m	3.8.3 & Table 3.8a	Use of quiet PME	Ching Cheung Road slip - superstructure	all times	The Contractor	
	4.5.4.5, 4.5.4.16, 4.5.4.24 & Table 4.5m	3.8.3, 3.8.4, 3.8.5 & Table 3.8a	Use of quiet PME, reducing the number of each type of PME to one and movable noise barriers located close to concrete lorry mixer, concrete pump, generator, air compressor and poker vibrator	Ching Cheung Road slip - road pavement	all times	The Contractor	
	4.5.4.5 & Table 4.5m	3.8.3 & Table 3.8a	Use of quiet PME	BV embankment - preparatory works	all times	The Contractor	
	4.5.4.5, 4.5.4.16, 4.5.4.24 & Table 4.5m	3.8.3, 3.8.4, 3.8.5 & Table 3.8a	Use of quiet PME, reducing the number of each type of PME to one and movable noise barriers located close to rock drill	BV embankment - earthworks excavation	all times	The Contractor	
	Table 4.5m	Table 3.8a	No mitigation measures required	BV embankment - road pavement	all times	The Contractor	
	4.5.4.5 & Table 4.5m	3.8.3 & Table 3.8a	Use of quiet PME	BV viaduct - substructure	all times	The Contractor	

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
	4.5.4.5 & Table 4.5m	3.8.3 & Table 3.8a	Use of quiet PME	BV viaduct - superstructure	all times	The Contractor	
	Table 4.5m	Table 3.8a	No mitigation measures required	BV - road pavement	all times	The Contractor	
	Table 4.5m	Table 3.8a	No mitigation measures required	Tunnel - preparatory works	all times	The Contractor	
	Table 4.5m	Table 3.8a	No mitigation measures required	Tunnel - portal construction	all times	The Contractor	
	Table 4.5m	Table 3.8a	No mitigation measures required	Tunnel - excavation	all times	The Contractor	
	Table 4.5m	Table 3.8a	No mitigation measures required	South portal building	all times	The Contractor	
	4.5.4.5, 4.5.4.16 & Table 4.5m	3.8.3, 3.8.4 & Table 3.8a	Use of quiet PME and reducing the number of each type of PME to one	Mid vent building - removal of spoil	all times	The Contractor	
	4.5.4.5, 4.5.4.16 & Table 4.5m	3.8.3, 3.8.4 & Table 3.8a	Use of quiet PME and reducing the number of each type of PME to one	Vent building foundation	all times	The Contractor	
	4.5.4.5 & Table 4.5m	3.8.3 & Table 3.8a	Use of quiet PME	Mid vent building - superstructure	all times	The Contractor	
Road traffic noise	4.6.5.31 & Fig 4.6x, 4.6y, 4.6z & 4.6aa	3.15.1	3m high roadside noise barrier located along the western side of the northbound carriageway of the direct connection to Route 9 (as recommended by the Route 9 study; CH: -410MN to -120MN)	Route 9 connection	During construction of the alignment	HyD/The Contractor	
	4.6.5.31 & Fig 4.6x, 4.6y, 4.6z	3.15.1	5m high roadside noise barrier located along the eastern side of the northbound carriageway of the direct	Route 9 connection	During construction of	HyD/The Contractor	

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
	& 4.6aa		connection to Route 9 (CH: -410MN to -210MN);		the alignment		
	4.6.5.31 & Fig 4.6x, 4.6y, 4.6z & 4.6aa	3.15.1	5m high roadside noise barrier located along the eastern side of the southbound carriageway of the direct connection to Route 9 (CH: -450MS to -75MS);	Route 9 connection	During construction of the alignment	HyD/The Contractor	
	4.6.5.31 & Fig 4.6x, 4.6y, 4.6z & 4.6aa	3.15.1	full enclosure located at Slip A (CH: +65A to +320A);	Route 16 slips to Lai Wan Interchange	During construction of the alignment	HyD/The Contractor	
	4.6.5.31 & Fig 4.6x, 4.6y, 4.6z & 4.6aa	3.15.1	full enclosure located at Slip B (CH: +150B to +370B);	Route 16 slips to Lai Wan Interchange	During construction of the alignment	HyD/The Contractor	
	4.6.5.31 & Fig 4.6x, 4.6y, 4.6z & 4.6aa	3.15.1	semi-enclosure located at Slip B (CH: +370B to +480B);	Route 16 slips to Lai Wan Interchange	During construction of the alignment	HyD/The Contractor	
	4.6.5.31 & Fig 4.6x, 4.6y, 4.6z & 4.6aa	3.15.1	3m high roadside noise barrier located on the western side of the northbound carriageway of LCKV (CH: +320A to +100MN);	LCK Viaduct	During construction of the alignment	HyD/The Contractor	
	4.6.5.31 & Fig 4.6x, 4.6y, 4.6z & 4.6aa	3.15.1	5m high roadside noise barrier located on the western side of the northbound carriageway of LCKV (opposite LCK Reception Centre Staff Quarters) (CH: +100MN to +455MN);	LCK Viaduct	During construction of the alignment	HyD/The Contractor	
	4.6.5.31 & Fig 4.6x, 4.6y, 4.6z & 4.6aa	3.15.1	3m high roadside noise barrier located on the western side of the southbound carriageway of the LCKV (opposite LCK Reception Centre Staff Quarters)) (CH: -75MS to +455MS);	LCK Viaduct	During construction of the alignment	HyD/The Contractor	

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
	4.6.5.31 & Fig 4.6x, 4.6y, 4.6z & 4.6aa	3.15.1	semi-enclosure located at the northbound carriageway of Route 16 mainline (opposite the CLP substation) (CH: +520MN to +650MN, +1074A to 970MN);	LCK Viaduct	During construction of the alignment	HyD/The Contractor	
	4.6.5.31 & Fig 4.6x, 4.6y, 4.6z & 4.6aa	3.15.1	5m x 2m cantilevered barrier located on the western side of the southbound carriageway of Route 16 (opposite the CLP substation) (CH: +975A to +1074A);	Butterfly Valley Viaduct	During construction of the alignment	HyD/The Contractor	
	4.6.5.31 & Fig 4.6x, 4.6y, 4.6z & 4.6aa	3.15.1	200m long semi-enclosure extending from the southbound of the Eagle's Nest South Portal (CH: +1200MS to +1370MS);	Route 16 mainline	During construction of the alignment	HyD/The Contractor	
	4.6.5.31 & Fig 4.6x, 4.6y, 4.6z & 4.6aa	3.15.1	7m high roadside noise barrier located on the eastern side of the southbound carriageway of Route 16 (opposite the planned landuse at Butterfly Valley) (CH: +970MS to +1200MS);	Route 16 mainline	During construction of the alignment	HyD/The Contractor	
	4.6.5.31 & Fig 4.6x, 4.6y, 4.6z & 4.6aa	3.15.1	4m high roadside noise barrier located on the northern side of the northbound carriageway of Route 16 (CH: +970MN to +1070MN);	Route 16 mainline	During construction of the alignment	HyD/The Contractor	
	4.6.5.31 & Fig 4.6x, 4.6y, 4.6z & 4.6aa	3.15.1	3m high roadside noise barrier located on the southern side of Slip D (CH: +445D to +565D); and	Ching Cheung Road slip	During construction of the alignment	HyD/The Contractor	
	4.6.5.31 & Fig 4.6x, 4.6y, 4.6z & 4.6aa	3.15.1	3m to 3.5m high roadside noise barrier located on the southern side of Slip E (CH: E+750E to +550D).	Ching Cheung Road slip	During construction of the alignment	HyD/The Contractor	
	4.6.6.5	-	Attenuators for mid ventilation building	Mid ventilation building	During the construction of mid ventilation	HyD/The Contractor	

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
					building		
Noise Monitoring	11.3	3.6	Construction noise monitoring at NSRs to meet noise criteria	NSRs	Construction	ET	
	11.4	3.14	Noise monitoring at NSRs to ensure effectiveness of direct technical remedies	NSRs	Commissioning of Road	ET	
Waste							
General	5.6.5	5.2.3.3	Training and instruction shall be given at site to construction staff to increase awareness and draw attention to waste management issues and the need to minimise waste generation. The training requirement shall be included in the site waste management plan.	All works area	All period during the construction phase	The Contractor	-
Storage, Collection and Transportation of Waste	5.6.6 & 6.4.4.11	5.2.4.1	Wastes shall be handled and stored in a manner to ensure that they are held securely without loss or leakage.	All works area	All period during the construction phase	The Contractor	Public Health and Municipal Services Ordinance (PHMSO)
	5.6.6	5.2.4.1	Authorised or licensed waste hauliers shall be used and they shall only collect wastes prescribed by their permits.	Waste/Refuse storage areas	All period during the construction phase	The Contractor	-
	5.6.6	5.2.4.1	Wastes shall be removed on a daily basis. .	Waste storage areas	Daily during the construction phase	The Contractor	PHMSO
	5.6.6	5.2.4.1	Waste storage areas shall be maintained and cleaned on a daily basis.	Waste storage areas	All period during the construction phase	The Contractor	-
	5.6.6	5.2.4.1	Windblown litter and dust during transportation shall be minimised by either covering trucks or transporting wastes in enclosed containers.	Waste handling trucks	After waste collection and before trucks leaving the construction site	The Contractor	Public Cleaning & Prevention of Nuisance By-laws.

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
	5.6.6	5.2.4.1	Obtain necessary waste disposal permits from the appropriate authorities if they are required.	-	Before the construction of the Project	The Contractor	*Waste Disposal Ordinance* (Cap 354), *Waste Disposal (Chemical Waste) (General) Regulation* (Cap 354), the *Land (Miscellaneous Provisions) Ordinance* (Cap 28);
	5.6.6	5.2.4.1	Wastes shall be disposed of at licensed waste disposal facilities.	-	All period during the construction phase	The Contractor	-
	5.6.6	5.2.4.1	Develop procedures such as a ticketing system to facilitate tracking of loads, particularly for chemical waste, and to ensure that illegal disposal of wastes does not occur.	-	All period during the construction phase	The Contractor and ET	-
	5.6.6	5.2.4.1	Maintain records of the quantities of wastes generated, recycled and disposed.	-	All period during the construction phase	The Contractor and ET	-
Surplus Excavated materials	5.6.7	5.2.5.1	Measures to minimise potential dust impacts: a) wetting the surface of the stockpiled soil with water when necessary especially during the dry season; b) covering the stockpiled soil with sheets; c) minimising disturbance of the stockpiled soil; and d) enclosure of the stockpiling area.	All works area	All period during the construction phase	The Contractor	Practice Note for Authorized Person and Registered Structural Engineers from the Building Department, and Air Pollutant Control (Construction Dust) Regulation
	5.6.7	5.2.5.4	Measures to reduce potential impacts to water quality a) separating surface water drainage system for the stockpiling area b) installation of silt traps for the surface water drainage	All work area	All period during the construction phase	The Contractor	ProPECC PN 1/94

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
			system; and c) covering stockpiled material with tarpaulin during heavy rainstorm.				
	5.6.7		Due to the high risk of loose material being washed into the existing nullah, stockpile materials should be properly compacted and covered from water erosion and located at least 10m away from the nullah wall	Works area	All period during the construction phase	The Contractor	
	5.6.8	5.2.5.2	Measures to minimise potential dust impacts due to haulage of excavated materials: a) Dropping heights for excavated materials shall be controlled to a practical height to minimise the fugitive dust arising from unloading. Materials shall not be loaded to a level higher than the side and tail boards, and shall be dampened or covered before transport. The travelling speed shall be reduced to 10 km per hour to reduce dust dispersion and re-suspension from the operating haul trucks. Wheel washing facilities shall also be installed and used by all vehicles leaving the site.	All works area	All period during the construction phase	The Contractor	Practice Note for Authorized Person and Registered Structural Engineers from the Building Department, and Air Pollutant Control (Construction Dust) Regulation
Construction and Demolition (C&D) Waste	5.6.9	5.2.6.1	Careful design, planning and good site management shall be adopted to minimise over-ordering and generation of waste materials such as concrete, mortars and cement grouts.	All works area	All period during the construction phase	The Contractor	-
	5.6.12	5.2.6.3	The handling and disposal of bentonite slurries shall be undertaken in accordance with *Practice Note for Professional Persons - Construction Site Drainage* (ProPECC PN 1/94) on construction site drainage.	All works area	All period during the construction phase	The Contractor	ProPECC PN 1/94

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
	5.6.11 & 5.6.13	5.2.6.2 & 5.2.6.4	Construction and demolition (C&D)material shall be segregated to inert and non-inert parts. The inert portion shall be re-used at areas of reclamation or land formation, or to public filling area shall such allocation is deemed necessary. The non-inert portion shall be disposed of to landfill.	All works area	All period during the construction phase	The Contractor	Works Branch Technical Circular 5/98
Chemical Waste	5.6.15	5.2.7.2	Chemical waste that is produced during construction shall be handled in accordance with the *Code of Practice on the Packaging, Handling and Storage of Chemical Wastes*.	Chemical waste arising point	All period during the construction phase	The Contractor	Code of Practice on the Packaging, Handling and Storage of Chemical Wastes
	5.6.17	5.2.7.3	a) Containers used for the storage of chemical wastes shall be suitable for the substance they are holding, resistant to corrosion, maintained in a good condition, and securely closed. b) Have a capacity less than 450 litres unless approved by EPD. c) Display a label in English and Chinese in accordance with instructions prescribed in *Schedule 2* of the *Chemical Waste Regulations*.	Chemical waste arising point	All period during the construction phase	The Contractor	-
	5.6.18 & 6.4.4.12	5.2.7.1	The chemical waste storage area should: be clearly labelled and used solely for the storage of chemical waste; be enclosed on at least 3 sides; have an impermeable floor and bunding, of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the largest; have adequate ventilation; be covered to prevent rainfall entering;	Chemical waste storage area	All period during the construction phase	The Contractor	-

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
			and be arranged so that incompatible materials are adequately separated.				
	5.6.19	5.2.7.5	Disposal of chemical waste shall be via a licensed waste collector; and to a facility licensed to receive chemical waste; or a reuser of the waste (under approval from EPD)	-	All period during the construction phase	The Contractor	Waste Disposal Ordinance (Chemical Waste) General Regulation
General Refuse	5.6.21 & 6.4.4.11	5.2.8.1	General refuse generated on-site shall be stored in enclosed bins or compaction unit separate from C&D and chemical wastes. A reputable waste collector shall be employed by the contractor to remove general refuse from the site, separately from C&D and chemical wastes, on a daily or every second day basis to minimise odour, pest and litter impacts. The burning of refuse on construction sites is prohibited by law.	All works area	All period during the construction phase	The Contractor	PHMSO & Air Pollution Control (Opening Burning) Regulation
	5.6.22	5.2.8.2	General refuse shall be generated largely by food service activities on site, so reusable rather than disposable dishware shall be used if feasible. Aluminium cans are often recovered from the waste stream by individual collectors if they are segregated or easily accessible; separate, labelled bins for their deposit shall be provided if feasible.	All works area	All period during the construction phase	The Contractor	-
	5.6.23	5.2.8.3	Office wastes can be reduced through recycling of paper if volumes are large enough to warrant collection. Participation in a local collection scheme shall be considered if one is available.	All works area	All period during the construction phase	The Contractor	-
Water							
Construction runoff and drainage	6.4.4.3	4.2.4	Use of sediment traps and the adequate maintenance of drainage systems to prevent flooding and overflow	All works area	All times during the construction phase	The Contractor	WPCO, ProPECC PN1/94

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
	6.4.4.4	4.2.5	Boundaries of critical areas of earthworks shall be marked and surrounded by dykes or embankments for flood protection. Temporary ditches shall be provided to facilitate runoff discharge into the appropriate watercourses, via a silt retention pond. Permanent drainage channels shall incorporate sediment basins or traps and baffles to enhance deposition rates	All works area	All times during the construction phase	The Contractor	WPCO, ProPECC PN1/94
	6.4.4.5	4.2.6	All temporary and permanent drainage pipes and culverts provided to facilitate runoff discharge shall be adequately designed for the controlled release of storm flows. All sediment traps shall be regularly cleaned and maintained. The temporarily diverted drainage shall be reinstated to its original condition when the construction work has finished or the temporary diversion is no longer required.	All works area	All times during the construction phase	The Contractor	WPCO, ProPECC PN1/94
	6.4.4.6	4.2.7	Sand and silt in the wash water from the wheel washing facilities, which ensure no earth, mud and debris is deposited on roads, shall be settled out and removed before discharging into storm drains. A section of the road between the wheel washing bay and the public road shall be paved with backfill to prevent wash water or other site runoff from entering public road drains.	All works area	All times during the construction phase	The Contractor	WPCO, ProPECC PN1/94
	6.4.4.7	4.2.8	Oil interceptors shall be provided in the drainage system and regularly emptied to prevent the release of oils and grease into the storm water drainage system after accidental spillage. The interceptor shall have a bypass to prevent flushing during periods of heavy rain.	All works area	All times during the construction phase	The Contractor	WPCO, ProPECC PN1/94
Tunnelling work	6.4.4.8	4.2.9	Temporary open storage of excavated materials shall be covered with tarpaulin or similar fabric during rainstorms. Any washout of construction or excavated materials from the drill-and-blast tunnelling work shall be diverted to the drainage system via appropriate sediment traps.	All works area	All times during the construction phase	The Contractor	-

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
	6.4.4.9	4.2.10	Ground water pumped out of tunnels shall be discharged into the drainage channels which incorporate sediment traps to enhance deposition rates and to remove silt.	All works area	All times during the construction phase	The Contractor	-
	6.4.4.10	4.2.11	Spent grouts used in diaphragm wall construction shall be collected in a separate slurry collection system, reconditioned and reused wherever practicable. The disposal of used grouting materials will only be permitted if it is treated to the TM standards before discharge to the storm drains or disposal to landfill.	All works area	All times during the construction phase	The Contractor	-
Sewage effluent during construction phase	6.4.4.13	4.2.14	Construction work force sewage discharges from fixed toilet facilities on-site shall be connected to the nearby existing trunk sewer wherever feasible. For areas where existing trunk sewer is not available, appropriate and adequate on-site portable chemical toilets shall be provided by a licensed contractor who will be responsible for appropriate disposal and maintenance of these facilities.	All works area	All times during the construction phase	The Contractor	WPCO, ProPECC PN 1-94
Ecology							
	7.7.3	6.1.2.1	Compensatory tree plantation on 3ha cut slope areas for loss of the 3ha secondary woodland. Native species shall be used taking reference of the species compositions in the surrounding.	Cut slope areas within Butterfly Valley as shown in Figure 7.7a	During design and construction stage	HyD and the contractor	-
	7.7.5	6.1.2.3	Stream habitat creation using natural substrate lining. Selected substratum shall resemble the existing conditions.	Along the alignment as shown in Figure 7.7d, schematic cross-section of re-created	During design and construction stage	HyD and the contractor	-

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
				stream shown in Figure 7.7e			
	7.7.6	6.1.2.4	Stream sedimentation during construction should be prevented by erection of sediment barriers and operation of stilling ponds in the streams within the Project Limit	Freshwater streams within Project Limit	All times during the construction phase	The Contractor	-
	7.7.7	6.1.2.5	Conduct a tree survey before commencement of the construction work	Woodland area to be loss due to the road construction	Detailed design stage	HyD	Works Branch Technical Circular (WBTC) No. 24/94 & Planning Environment and Lands Branch Technical Circular (PELBTC) No. 3/94 on Tree Preservation
	7.7.8	6.1.2.6	The woodland area to be encroached upon by development should be well-defined and minimised, and regular checks should be made to ensure that the work site boundaries are not exceeded and that no damages caused to the surrounding areas	Construction sites within Butterfly Valley	All times during the construction phase	The Contractor	-
	7.7.8	6.1.2.6	Fences shall be erected along the boundary of construction sites before commencement of works and regular check on such boundaries	Construction sites within Butterfly Valley	All times during the construction phase	The Contractor	-
	7.7.8	6.1.2.6	Loss of the adjacent woodland due to temporary land take shall be returned to the original status immediately	Woodland area loss due to temporary work sites	After construction phase	The Contractor	-
	7.7.8	6.1.2.6	Wild and uncontrolled fire shall be strictly prohibited	Construction sites	All times during the construction phase	The Contractor	-

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
Hazard							
Construction Phase	8.2.7.1	-	The drum stock at Tai Po Road WTW should be reduced to 3 drums (2 duty and 1 standby) and deliveries of chlorine should be made on a 'just in time' basis during the period of construction of Route 16.	Tai Po Road WTW	During Construction	HyD/ WSD	-
	8.2.7.1	-	The store ventilation extracts at Tai Po Road WTW should be modified to include faster-closing louvres.	Tai Po Road WTW	During Construction	HyD/ WSD	
	8.2.7.1	-	The door alarm installation at Tai Po Road WTW should be reviewed, and modified as necessary, such that the alarm 'timer' allows sufficient time for the chlorine unloading operation to take place (ie unloading of one full drum into the store and removal of one empty drum) but that, once sounding, the alarm cannot be de-activated without closing the doors and re-setting the alarm.	Tai Po Road WTW	During Construction	HyD/WSD	
	8.2.7.1 & Figure 8.2j	-	A chlorine barrier should be provided at Tai Po Road WTW to block travel of chlorine towards the Route 16 construction site. The required height of the barrier is estimated to be 7m, whilst the location of the barrier is indicated in *Figure 8.2j*. The barrier should be constructed of a material capable of resisting corrosive attack by chlorine (for a design life of two years).	Butterfly Valley road section and Tai Po Road WTW	During Construction	HyD/ WSD/ The Contractor	
	8.2.7.1	-	Construction activities should be suspended during delivery and unloading of chlorine at Tai Po Road WTW, ie construction workers should be evacuated to a minimum distance of 500m from the chlorine store (if outdoors) or to a place of safety indoors (ie a toxic refuge) during the movement of the chlorine truck along the access road at Tai Po Road WTW and during the	Construction Sites	During Construction	HyD/ WSD/ The Contractor	

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
			drum loading/unloading operation.				
	8.2.7.1	-	Construction activities within 100 metres of the chlorine store at Tai Po Road WTW (including activities within the Eagle's Nest tunnel up to a distance of 200m from the portal and activities within 200m of the access road to Shek Lei Pui WTW) should be restricted to day-time only (7am-7pm) with a maximum of 30 workers. Increased numbers of workers could be tolerated at correspondingly reduced working hours, eg 60 workers for 6 hours each day. Construction activities within 500m of the chorine store at Tai Po Road WTW should also be restricted to day-time only with a maximum of 70 workers (or equivalent at reduced working hours). Facilities such as workshops, offices etc should be located beyond 500m from the chlorine store at Tai Po Road WTW, as far as reasonably practicable.	Tai Po Road WTW	During Construction	HyD / Contractor	-
	8.2.7.1	-	The following emergency measures shall be implemented in line with best practice: • construction workers within 500m of Tai Po Road and Shek Lei Pui WTWs (the extent of the 50% fatality contour for a 1 tonne instantaneous release) should receive information and training in relation to the hazards posed by the WTWs and what action they should take in the event of an emergency; • toxic refuges should be provided at the construction site, ie well-sealed buildings, with a bottled air supply capable of maintaining the interior of the building at a positive pressure with respect to the outside so as to maintain safe conditions within the refuge for a period of at least 1 hour (ie chlorine concentrations below 3ppm, which is the US ERPG-2(1) level). The toxic	Work Site	During Construction	The Contractor / HyD	-

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
			refuges should have sufficient capacity for the number of workers who may need to use them, ie capacity for at least 30 workers within 100m of the chlorine store at Tai Po Road WTW and a further 40 workers within 500m (noting however that increased capacity should be provided if reduced working hours are to be adopted). The toxic refuges should be equipped with self-contained breathing apparatus (SCBA), ie escape sets, sufficient for the number of workers who may need to use the refuge (as above). The toxic refuges should contain equipment to facilitate communication with external parties; • construction workers out of easy reach of a toxic refuge (eg in the Eagle's Nest Tunnel) should have ready access to SCBA at their work locations; • construction workers should receive information, instruction and training in the use of SCBA; • in the event of a chlorine release, any temporary ventilation intakes for the Eagle's Nest Tunnel should be shutdown rapidly (or preferably reversed) to minimise ingress of chlorine into the tunnel from the south portal; • a means of providing a rapid, direct warning to construction workers in the event of a hazardous chlorine release at Tai Po Road or Shek Lei Pui WTW should be provided (eg a siren audible within 500m); • chlorine gas alarm(s) should be provided at construction areas within 100m of the chlorine store at Tai Po Road WTW to provide an additional direct warning to construction workers of a chlorine release; • the access road to the Route16 construction areas				

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
			should be adequate for access by the emergency services and should be maintained clear; • the emergency services should familiarise themselves with the emergency arrangements for the Route 16 construction site, including the locations of the toxic refuges, site access arrangements etc; • the Route 16 contractor should develop an emergency plan in accordance with the recommendations above, which should dovetail with those of WSD and the external emergency services.				
	8.2.7.1	-	In view of the close proximity of the Route 16 construction site to Tai Po Road WTW (ie within 30m), a hazard review should be undertaken prior to the commencement of construction to address any hazards which the construction activities may pose to the safe operation of the WTW, eg relating to fire, slope failure, dropped objects etc.	-	Design and Construct	HyD/ The Contractor	
Operational Phase	8.2.7.1 & Figure 8.2j	-	The existing chlorine building at Tai Po Road WTW should be replaced by a new chlorine building (with indoor unloading bay and using chlorine in 50kg cylinders) at a new location as shown *Figure 8.2j*.	Tai Po Road WTW	During construction of Route 16	HyD/ WSD /The Contractor	
	8.2.7.1 & Figure 8.2a	-	The on-site and off-site emergency plans for Tai Po Road WTW and Shek Lei Pui WTW should be updated to include provision for direct warning of a hazardous chlorine release by WSD staff at the WTWs to the Route 16 Tunnel Operator so that the following action can be taken by the Route 16 Tunnel Operator: i. Route 16 southbound traffic should be stopped at the toll plaza at the Sha Tin end of the Eagle's Nest Tunnel; ii. Route 16 northbound traffic should be prevented	-	Design and Construction	HyD/ WSD/ The Contractor	

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
			from entering the Consultation Zones of Tai Po Road WTW and Shek Lei Pui WTW by activation of signage which should be located on the slip road from Ching Cheung Road (eastbound) onto Route 16 (northbound) and on the Lai Chi Kok viaduct (northbound) section of Route 16 (Route 16 will be supported by a Traffic Control and Surveillance System). Indicative locations for the signage on Ching Cheung Road are shown in *Figure 8.2a*. iii. The Eagle's Nest Tunnel ventilation fans should be shut down (and preferably reversed to blow air out of the tunnel) to minimise ingress of chlorine into the tunnel; and iv. Any tunnel operating staff who may be present at the south portal (the south ventilation building will not normally be occupied) should: • go indoors and close all windows, doors and other openings; • remain indoors until instructed by the emergency services (ie FSD/Police) that it is safe to leave the building; and • upon instruction to go outdoors, ventilate the building by opening all windows and doors.				
	8.2.7.1	-	An emergency plan, which forms part of the tunnel operating manual, should be developed during the detailed design of Route 16 in accordance with items (i)-(iv) above, which should dovetail with those of WSD and the emergency services.	-	Design and Construction	HyD/ WSD/ The Contractor	
	8.2.7.1	-	The store ventilation extracts at Shek Lei Pui and Tai Po	Shek Lei Pui	Design and	HyD/ WSD/ The	

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
			Road WTW should be modified to include faster-closing louvres.	and Tai Po Road WTW	Construction	Contractor	
	8.2.7.1	-	The door alarm installation at Shek Lei Pui WTW should be reviewed, and modified as necessary, such that the alarm 'timer' allows sufficient time for the chlorine unloading operation to take place (ie unloading of one full drum into the store and removal of one empty drum) but that, once sounding, the alarm cannot be de-activated without closing the doors and re-setting the alarm. The recommendation is also made for Tai Po Road WTW where an alarm system was about to be installed at the time of the Consultants' site visit in January 1999.	Shek Lei Pui and Tai Po Road WTW	Design and Construction	HyD/ WSD/ The Contractor	
	8.2.7.1 & Figure 8.2j	-	A 3m high solid fence around the chlorine store along with a low-cost part enclosure in front of it is recommended for Shek Lei Pui WTW. This will provide a 180 degree protection for small chlorine releases within the store, leaks due to loading/unloading activities and will also provide protection for releases due to some seismic events. The fence will be approximately 100m long and will extend to the two traffic barriers on the access road. The fence and enclosure are shown in *Figure8.2j.*	Shek Lei Pui WTW	Design and Construction	HyD/ WSD/ The Contractor	
Landscape and Visual Impact							
	9.8.16	-	*Landscape mitigation measure 1 (LMM1) – Construction programming and management.* The construction programme for the Project shall be reduced to the shortest possible period, particularly in those locations where severe or high landscape and visual impacts are expected, e.g., LCK Reception Centre low-rise staff quarters (KV9) and Butterfly Valley. Additionally, the periphery of the works areas at street level shall be managed so that they do not appear cluttered, untidy	-	Design and Construction	The Contractor / HyD	-

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
			and unattractive and inconvenient to pedestrians. For example, all hoarding shall be colorfully designed with interesting motifs demonstrating the work of Highways Department. Hoardings with bland colours shall be avoided.				
	9.8.17	-	*Landscape mitigation measure 2 (LMM2) - Advanced planting and erosion control works.* Where possible, the transplantation of existing valuable trees, the stockpiling of topsoil, new planting and erosion control works shall be carried out as early as possible in the construction period instead of at the end. This will assist in maximizing the time for carrying out transplantation and new planting, resulting in a higher success rate for the survival of transplanted trees and the establishment of new screen trees. The stockpiling of topsoil will provide an abundant use of on-site material for growing media. During detailed design, the issue of stockpiling of topsoil in a manner that would avoid washing into the drainage scheme should be examined comprehensively.	Work site	Design and Construction	HyD / The Contractor	-
	9.8.18	-	*Landscape mitigation measure 3 (LMM3) – Maximization of amenity planting in road corridor.* Opportunities to incorporate amenity areas along the alignment shall be maximized to provide visual relief in an otherwise congested urban area.	Project limit	Design and Construction	HyD / The Contractor	-
	9.8.19	-	*Landscape mitigation measure 4 (LMM4) –Design, materials and finishes of engineering structures.* The quality of the design of all engineering structures, which will include viaducts, parapets, piers, slip roads, noise barriers, noise enclosures and drainage systems are an important consideration. They shall be designed in accordance within HyD's guidelines, but equally attention shall be given to design modern and attractive structures. Correctional Services Department shall be	Road structures	Design and Construction	HyD / The Contractor	-

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
			consulted about the design of an architectural screen adjacent to its low rise staff quarters.				
	9.8.20	-	*Landscape mitigation measure 5 (LMM5) – Rural area under-viaduct soft landscape works.* Where viaducts result in sterilized space under viaducts in Butterfly Valley, compensatory landscape works shall be provided to enhance and restore the function of the land. Access to these areas could be provided for visual inspections of the viaducts and for maintenance. Water could be provided by installing holding tanks which can collect surface water run-off from neighboring streams.	Viaduct section	Design and Construction	HyD / The Contractor	-
	9.8.21	-	*Landscape mitigation measure 6 (LMM6) – Planting on rock berms.* Where rock is exposed by earthworks, planting will be implemented by constructing stone walls on berms and backfilling behind them with topsoil.	Road berms	Design and Construction	HyD / The Contractor	-
	9.8.22	-	*Landscape mitigation measure 7 (LMM7) – Environmental design at focal points.* At important vehicular and pedestrian junctions, specially designed features such as sculptures, and ornamental paving shall be incorporated.	Project limit	Design	HyD / The Contractor	-
	9.8.23, Figures 9.9 (a-c)	-	*Landscape mitigation measure 8 (LMM8) – Maximization of woodland planting on disturbed land.* All land disturbed by construction shall be restored to an equivalent standard or higher. All felled mature trees which are considered to be high in environmental amenity, a replacement of a similar size shall be planted where possible. All felled mature trees which are considered to be high in environmental amenity, a replacement of a similar size should be planted. Where except where slope or ground conditions prevent the planting of mature trees, other locations as close as possible to the location of the felled tree within the works area should be used. Existing woodland cleared by	Project limit	Design / construction	HyD / The Contractor	-

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
			construction activity will also be replaced at a ratio of at least twenty trees planted for every tree felled. All planting on slopes should be in accordance with Works Branch Technical Circular 25/93. Figures 9.9(a-c) in the EIA report illustrate a potential cut and cover tunnel approach to the alignment in Butterfly Valley whereby woodland planting could be possible over the road. This may increase the area available for compensatory planting.				
	9.8.24	-	*Landscape mitigation measure 9 (LMM9) – Urban area under-viaduct hard and soft landscape works.* Where viaducts result in sterilized space under viaducts, extensive hard and soft landscape works shall be provided to enhance and restore the function of the land, including creepers and climbers on retaining walls and supporting columns.	Berms and slopes	Design	HyD / The Contractor	
	9.8.25, Figures 9.9 (a-b)	-	*Landscape mitigation measure 10 (LMM10) – Re-creation of stream in Butterfly Valley.* The existing stream should be recreated adjacent to the fill slope in Butterfly Valley (see Figure 9.9a and 9.9b in the EIA report for details).	Fill slope in Butterfly	Design	HyD / The Contractor	
	10.7.3		Visual inspection of the 5 historic buildings in Tin Sam Village and the historic buildings within Lai Chi Kok Hospital before construction of Route 16 commence. All structural defects that could be identified will be recorded and the record will be copied to AMO for record	5 historic buildings in Tin Sam Village and the historic buildings with LCK Hospital	Before construction commence	Contractor	
	10.7.3		Structural inspection survey for the 5 historic buildings in Tin Sam Village and the historic buildings within Lai Chi Kok Hospital will be made in quarterly intervals. Critical structural members, such as main beams and columns will also be included in the quarterly inspection.	5 historic buildings in Tin Sam Village and the historic	During construction	Contractor	

Parameter	EIA Ref.	EM&A Ref.	Mitigation Measures/Key EM&A Requirements	Location	Timing	Responsibility	Relevant Legislation and Guidelines
			Inspection survey record will be copied to AMO for record.	buildings with LCK Hospital			
	10.7.3		Measurement of vibration would also be carried out on a need basis during the piling work	Work site	During construction	Contractor	
	10.7.4		A piezometer in Butterfly Valley will be installed to monitor any change in the level of ground water table. The measurement will be made twice a month during construction. Measurement record will be copied to AMO for record.	Butterfly Valley	During construction	Contractor	

Notes:

EIA = Route 16 Investigation Assignment - Alternative Alignment

EM&A = Environmental Monitoring and Audit Manual

ET = Environmental Team

APCR = Air Pollution Control (Construction Dust) Regulation

PME = Powered Mechanical Equipments

HyD = Highways Department, Major Works Project Management Office

AMO = Antiquities and Monuments Office