



Water Supplies Department

The Government of the Hong Kong Special Administrative Region

**PWP Item No. 4108CD -
West Kowloon Drainage Improvement - Lai Chi Kok Transfer Scheme
Inter-reservoirs Transfer Scheme
Water Tunnel between Kowloon Byewash Reservoir and
Lower Shing Mun Reservoir**

PROJECT PROFILE

September 2006

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Lower Shing Mun Reservoir**

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Appendix I - Location Plan - Sketch No. 90154/1

Appendix II - Photographs of the tentative locations for the proposed intake and
outfall structures

Appendix III - Tentative Programme

1. Basic Information

1.1 Project Title

1.1.1 The title of the proposed project is “West Kowloon Drainage Improvement - Lai Chi Kok Transfer Scheme - Inter-reservoirs Transfer Scheme” (hereafter refer to the “Project”).

1.2 Purpose and Nature of the Project

1.2.1 The drainage catchments in Sham Shui Po, Cheung Sha Wan and Lai Chi Kok including their adjacent hillsides span across very large areas. The existing drainage system was developed some 40 years ago. The system is not able to cope with the development of the areas in the past few decades. Flooding is not uncommon during heavy rainstorms leading to traffic disruption, damage to properties and poses threat to the safety of the public.

1.2.2 To alleviate the problem, Drainage Services Department (DSD) has started a number of urban drainage improvement works in these areas. These drainage improvement works are now underway.

1.2.3 On top of these improvement works, the overall drainage systems will need to be upgraded to meet the required flood protection standard. In this respect, DSD has commissioned the Lai Chi Kok Transfer Scheme (LCKTS) which forms an integral part of the overall flood control strategy for West Kowloon. With the Scheme, the surface runoff from the hinterland and the potential overflow from the Kowloon Group of Reservoirs¹ will be intercepted upstream and then discharged directly to Victoria Harbour near Stonecutters Island through a proposed drainage tunnel.

1.2.4 During the development of the LCKTS, Water Supplies Department (WSD) incubated the idea of developing a system to transfer water from the Kowloon Group of Reservoirs to Lower Shing Mun Reservoir. The purpose of this system, named Inter-reservoir Transfer Scheme (IRTS), is to reduce the quantity of the overflow from the Kowloon Group of Reservoirs into the LCKTS by transferring water in Kowloon Byewash Reservoir to Lower Shing

¹ Kowloon Group of Reservoirs comprise Kowloon Reservoir, Shek Lei Pui Reservoir, Kowloon Reception Reservoir and Kowloon Byewash Reservoir

Mun Reservoir via a new water tunnel. The IRTS will serve dual objectives of substantially reducing the quantity of overflow to the Lai Chi Kok area, and hence a reduced scope of the LCKTS as well as making better use of the water collected by the Kowloon Group of Reservoirs which will otherwise overflow into the Butterfly Valley and discharge into the sea.

- 1.2.5 The scope of the Project comprises the construction of a water tunnel, approximately 2.8 km in length and 3 m in diameter, from Kowloon Byewash Reservoir to Lower Shing Mun Reservoir and the associated intake and outfall structures at both ends of the tunnel.

1.3 Name of Project Proponent

- 1.3.1 The project proponent is Water Supplies Department.

1.4 Location and Scale of Project and History of Site

- 1.4.1 A location plan for the Project is attached in **Appendix I**. The water transfer tunnel is located beneath the Kam Shan Country Park and crosses over the High Island Water Tunnel. The proposed intake structure for the IRTS falls within the Kam Shan Country Park. Photographs of the tentative locations for the proposed intake and outfall structures are at **Appendix II**.

- 1.4.2 At present, it is envisaged that the transfer tunnel will be constructed using drill and blast techniques or tunnel boring machine (TBM) depending on the ground conditions after ground investigation.

1.5 Number and Types of Designated Projects

- 1.5.1 The Project falls partly within the Kam Shan Country Park and, is therefore is a Designated Project under Item Q.1 of Part I of Schedule 2 of the Environmental Impact Assessment Ordinance (Cap. 499) (EIAO).

1.6 Name and Telephone Number of Contact Person(s)

- 1.6.1 The contact person is Mr. Lee Chi Ming, Senior Engineer, Water Supplies Department, telephone no. 2829 5637.

2. Outline of Planning and Implementation Programme

2.1 Responsibilities of Parties

2.1.1 WSD will take up the responsibilities for planning, design, construction and operation of the Project. WSD will commission consultants to undertake investigation, engineering design and site supervision of construction works and to conduct an Environmental Impact Assessment (EIA) study. The construction of the Project will be undertaken by contractor(s) to be appointed by WSD at a later stage.

2.2 Project Time Table

2.2.1 The Environmental Impact Assessment, Investigation and detailed design consultant(s) will be appointed in the second quarter of 2007. The investigation and detailed design of the Project will be carried out between mid 2007 to early 2010. Construction is scheduled to commence in early 2010 for completion in end 2012. A tentative programme is at **Appendix III**.

2.3 Interactions with Other Projects

2.3.1 No insurmountable impacts on any existing or planned projects have been identified.

3. Possible Impact on the Environment

3.1 Summary of Preliminary Environmental Review Findings

3.1.1 The potential environmental impacts associated with the construction and operation of the Project have been identified and evaluated in the Preliminary Environmental Review completed in 2005. It is found that the main components of the Project which will have environmental impacts comprise the following:

- The intake in Kowloon Byewash Reservoir and potential impacts on water quality, ecology and visual impacts;
- The outfall in Lower Shing Mun Reservoir and potential impacts on water

quality, ecology and visual impacts;

- The tunnel alignment and volume of excavated materials generated from tunnelling; and
- Air and noise impacts from construction activities.

3.1.2 The following sections describe the potential environmental impacts during construction and operational phases, which will be alleviated by effective and pragmatic mitigation measures designed according to the assessed levels of impact.

Construction Phase Impacts

Air Quality

3.1.3 Potential air quality impacts may arise from fugitive dust emissions generated by construction activities such as excavation, cutting, filling, concrete batching, rock crushing, stockpiling and construction vehicle movements.

Noise & Vibration

3.1.4 Airborne noise will be generated during construction of the Project. Airborne noise will be generated from excavation, backfilling, road reinstatement and construction of above ground structures. Groundborne vibration may be generated due to tunnel construction by either TBM or drill and blast methods.

Water Quality

3.1.5 Water quality impacts may arise due to the following potential sources during construction of the Project:

- Run off due to erosion of exposed surfaces, accidental spillage from plant maintenance etc, materials handling and other works areas;
- Wash out from concrete batching plants;
- Drainage water due to tunnel construction;
- Groundwater extracted during underground construction; and
- Construction workforce sewage.

Ecology

- 3.1.6 The potential environmental impacts of the proposed intake and outfall structures will be assessed. Site clearance around the area of the structures will result in loss of vegetation. The amount of vegetation likely to be lost will include the actual opening and some of the surrounding area for slope stabilisation works and tunnel portals construction. This area is currently sparsely vegetated and the potential outfall location is on a sandy reservoir bank. It is not anticipated that any of the vegetation affected will be rare flora species. A piece of wooded area comprising mostly of native species above the proposed outfall structure at Lower Shing Mun Reservoir is slightly be affected. However, the trees that are not in direct conflict with the construction works should be preserved as far as possible. If trees are unavoidably affected, suitable compensatory planting will be proposed. As the proposed works are within the Country Park, consent of the Country and Marine parks Authority for implementation is required. Details of the proposal with large-scale construction drawings and tree felling proposal will be submitted to the Authority for consideration when available. In principle, the proposed works would not affect the park provisions and vegetation in the Country Park.
- 3.1.7 As the intake portal will be contained within the Kowloon Byewash Reservoir there will be minimal ecological impacts at the southern end of the tunnel.
- 3.1.8 Potential ecological impacts caused by draining down of the Kowloon Byewash Reservoir and Lower Shing Mun Reservoir during the construction phase should be considered.
- 3.1.9 Wild monkeys being in the vicinity of the proposed work sites will also be included as sensitive receivers.

Waste Impacts

- 3.1.10 Construction activities will result in the generation of a variety of surplus materials that may include:
- Excavated materials;
 - Construction and demolition (C&D) materials and wastes;

- Site clearance waste;
- Chemical waste of residual oil and lubricating fluid from construction plant and machinery; and
- General refuse from worksites.

3.1.11 It is estimated that approximately 30,000m³ of spoil will be generated from the Project. Inert excavated materials and construction and demolition materials will be properly segregated and will either be reused on site, or disposed of at available designated public filling areas in accordance with the guidance from the Fill Management Committee.

Visual Impacts

3.1.12 Short term visual and landscape impacts due to the construction activities, stockpiles, temporary structures and machinery will occur. As most of the permanent works will be buried underground, there will be no long term visual and landscape impacts.

3.1.13 An additional visual impact will be the temporary draw down of the Kowloon Byewash Reservoir and the Lower Shing Mun reservoir during the construction phase.

Cultural Heritage Impacts

3.1.14 There are no known archaeological sites along the tunnel alignment, and the majority of the alignment is a deep tunnel. It is proposed that a preliminary scoping assessment may be required as part of the EIA to ascertain whether there is anything of cultural or archaeological importance in the vicinity of the tunnel outfall.

Operation Phase Impacts

Noise Impacts

3.1.15 Maintenance of the tunnel will be necessary and this may generate some noise through the use of mechanical equipment. As maintenance is likely to be less than once per year the impacts are considered minimal.

Air Quality Impacts

3.1.16 Maintenance of the tunnel may involve some sediments to be removed. Since the water passing through the tunnel is considered to be good quality, it is unlikely that any sediment will be odorous. As maintenance is likely to be less than once per year the impacts are considered to be minimal.

Water Quality Impacts

3.1.17 The tunnel only connects two reservoirs and therefore operation of the tunnel will not give rise to any water quality impacts.

Visual Impacts

3.1.18 The visual impact at the operation phase of the Project is considered to be minimal. There will be a visible intake at the Kowloon Byewash Reservoir with minimal impact and an outfall at the Lower Shing Mun reservoir. Provided the structures are well designed and suitable compensatory planting has been carried out it is expected that visual harmony can be achieved.

3.1.19 Another potential visual impact will be the reservoirs draw down during wet season as part of the reservoir management plan.

4. Major Elements of the Surrounding Environment

4.1 The Project partly falls within the Kam Shan Country Park and water gathering grounds (WGG). Kam Shan Country Park is a rural area of Hong Kong which is not generally impacted by excessive noise or air pollution. The IRTS will affect Kowloon Byewash and Lower Shing Mun Reservoirs which are used for storage of potable water collected from runoff within the country park. These reservoirs fall within the Tolo Harbour Supplementary Water Control Zone and the Victoria Harbour Phase 2 Water Control Zone.

4.2 Water quality in the reservoirs is expected to be good as monitoring

downstream at the closest EPD inland monitoring station, TR19A, located at the upstream part of Tai Wai Nullah was recorded as "Excellent" by the EPD *River; Water Quality Monitoring in 2002* report. This monitoring location complied with all Water Quality Objective's except *E. coli*.

- 4.3 Noise levels close to the reservoirs are low with few roads or other users in the vicinity. There are no EPD air quality monitoring stations in the vicinity of either reservoir. However, air quality is considered to be considerably better than at the nearest monitoring stations which are located in Sha Tin and Sham Shui Po. These monitoring locations are in densely populated urban areas and are not considered representative for comparison to the country park location of this study.
- 4.4 The area proposed for the tunnel outfall is a sparsely vegetated slope colonised with natural low bushes and scrub. The slope is predominantly bare ground which under normal reservoir water levels will be submerged.

5. Environmental Protection Measures to be Incorporated in the Design and any further Environmental Implications

- 5.1 Potential measures have been proposed to minimize environmental impacts, as outlined below. These measures will be further reviewed during the EIA process.

Construction Phase

Air Quality

- 5.2 Air pollution control measures such as the regular maintenance and checking of equipment, and Dust Control Requirements stipulated under the Air Pollution Control Ordinance (APCO) should be followed throughout the construction period to minimise air quality impacts.
- 5.3 Construction phase mitigation could be provided through measures such as:
- Water spraying of areas / stockpiles susceptible to erosion;
 - Tarpaulins should be used to cover particularly susceptible locations;
 - Hydroseeding or shotcreting of temporary slopes may be considered to prevent erosion during the wet season;

- Vehicles leaving and entering the site should have their loads covered;
 - Wheel washing facilities should be provided;
 - Vehicles and equipment should be regularly serviced to prevent the emission of harmful gasses;
 - If blasting is required screens should be erected around the outfall or intake to prevent the dispersion of dust. Also, the areas within 30m from the blasting area should be wetted with water prior to blasting; and blasting should not be carried out when the strong wind signal or tropical cyclone warning signal No. 3 or higher is hoisted unless prior permission of the Commissioner of Mines is obtained.
- The Caldecott Hill and the Tai Po Road Water Treatment Works Staff Quarters which are located within 500 m from the proposed intake structure at Kowloon Byewash Reservoir with their respectively elevation of approximately 48 m and 11 m above the structures are likely be the air sensitive receivers for air impact.

5.4 Provided appropriate measures to control dust are provided air quality impacts should be minimal. This should be further assessed taking construction methods into account at the EIA stage.

Noise & Vibration

5.5 The Tai Po Road Water Treatment Works Staff Quarters which is located about 140m from the proposed intake structure at Kowloon Byewash Reservoir is likely be the sensitive receiver for noise and vibration impacts. Construction Noise can be readily mitigated by following the guidelines of ProPECC Notes PN 1/93 and PN 2/93 which outline statutory and non-statutory controls for noise from construction activities.

5.6 A package of mitigation measures will be designed to control construction noise & vibration impacts. General good site practices will help to control the noise impacts. These include:

- Care in the placement and orientation of noisy plant away from sensitive receivers;
- The use and correct fitting of silencers, mufflers and acoustic shields;
- Regular maintenance of plant and equipment;
- Scheduling of works so as not to carry out major works when usage of the Country Park is high; and
- Where possible noisy activities should be carried out during normal working hours. The likelihood of the need to operate a TBM 24 hours a day should be

assessed at the EIA stage.

- 5.7 Further mitigation measures such as the use of quiet plant, noise barriers and reducing the number of plant in use at any one time would help to control daytime noise impacts to within the noise criterion specified under the Technical Memorandum on Environmental Impact Assessment Process and Noise Control Ordinance. In circumstances where it would not be feasible to meet the noise criteria, Indirect Technical Remedies may be proposed.

Water Quality

- 5.8 Water quality impact mitigation measures will include the use of sand traps, wheel washing facilities for vehicles leaving the site, adequate maintenance of drainage systems to prevent flooding and overflow, sewage collection and treatment, and comprehensive waste management (collection, handling, transportation, disposal) procedures in accordance with the Practice Note for Professional Persons on Construction Site Drainage (ProPECC PN 1/94). More stringent measures will be implemented including the restriction on use and storage of fuels, chemicals and construction materials within the water catchment.

Waste Management

- 5.9 Waste management measures will be formulated to minimise potentially adverse impacts associated with handling, collection and disposal of waste arising from the construction and operation of the proposed Project. Waste management measures will include:
- General good housekeeping practices;
 - Sorting and segregation of wastes for reuse and disposal;
 - Observing the requirements of the waste disposal licenses;
 - Meeting the requirements of the Waste Disposal Ordinance;
 - Consideration of reusing excavated inert materials both on site and off site. Useful contents in the C&D materials will be recycled where practicable and disposal at landfill sites will be considered as a last resort. Waste management hierarchy will be implemented to minimize waste generation and maximize waste recovery and recycling.
- 5.10 Chemical wastes will be handled according to EPD's guidelines and in case temporary storage becomes necessary for the chemical waste, this would be handled in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Waste.

Ecology

- 5.11 The potential ecological impact can be minimised by careful planning of the outfall portal location and any necessary works areas to avoid unnecessary disturbance to the surrounding plants, and to facilitate compensatory planting. Appropriate landscaping should be recommended in the EIA which will allow for reinstatement of natural habitats following the works.
- 5.12 It is expected that residual impacts will be minimal following sensitive replanting. This can have the beneficial effect of allowing for planting of native species if it is found that the vegetation currently in this area consists of exotics, and of potentially camouflaging any structures associated with the works.

Visual Impact

- 5.13 Potential landscape and visual impact mitigation measures to be implemented during construction phase would include:
- Avoidance of impacts on adjacent landscape by minimizing temporary works areas;
 - Control of night-time lighting for works;
 - Disturbance to planted slopes to be avoided where possible; and, if necessary reinstated;
 - Compensatory tree planting to be incorporated along tunnel portals, public open spaces, amenity areas affected by the Project;
 - Works areas to be minimised and fenced to minimise visual impacts. Good housekeeping and the erection of decorative screen hoarding would minimise the intrusion to the surrounding land users;
 - Issues associated with the visual impact of the draw down of the reservoir levels to be handled by keeping the public informed as to the progress of the works and their necessity.

Cultural Heritage Impact

- 5.14 There are no known archaeological sites along the tunnel alignment, and the majority of the alignment is a deep tunnel. It is proposed that a preliminary scoping assessment may be required as part of the EIA to ascertain whether there is anything of cultural or archaeological importance in the vicinity of the tunnel outfall.
- 5.15 The Grade II Dam and Valve House of the Kowloon Byewash Reservoir, the Grade II Dam (Northeast) and Valve House of the Shek Lei Pui Reservoir which are in the close proximity to the proposed tunnel alignment will not be



disturbed due to the proposed works.

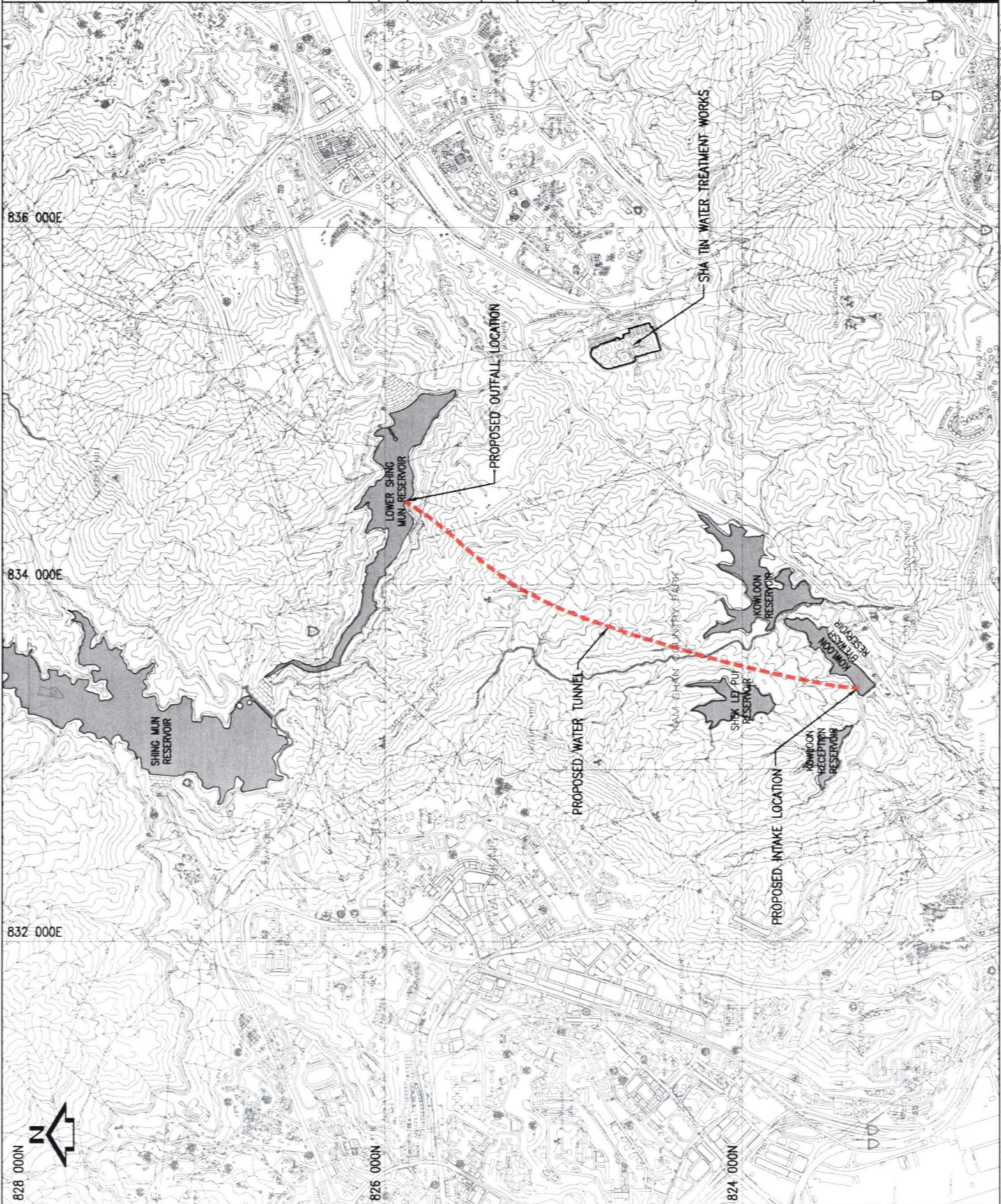
Operation Phase

5.16 Suitable landscaping design shall be considered to mitigate the potential visual impact due to implementation of the reservoir management plan. Apart from that particular mitigation measures will not be required as no major operational impacts are expected.

6. Use of Previously Approved EIA Reports

6.1 No previous approved EIA report has been used.

Appendix I	
NOTES:	
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1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.	
2. THE BASE PLAN IS EXTRACTED FROM SURVEY SHEET NO. T-7 & T-11.	
LEGEND :	
 PROPOSED WATER TUNNEL.	
編號日期 no. date	摘要 description
REVISION	
核准 approved	日期 date
MAK Sai King	09/12/2005
(ORIGINAL SIGNED) SE/PP(2)	
策劃報告書編號 planning report no.	6/2005
檔案編號 file no.	WSD 4918/2/1/4/05
工程編號 project no.	4108CD
工程名稱 project title	
INTER-RESERVOIR TRANSFER SCHEME – TRANSFER OF WATER FROM KOWLOON BYEWASH RESERVOIR TO LOWER SHING MUN RESERVOIR	
草圖名稱 sketch title	
LOCATION OF WORKS	
草圖編號 sketch no.	比例 scale
90154/1	1 : 20 000
工程策劃組 Project Planning Units	
 水務署 Water Supplies Department	



DATE: 06-12-2005
 PLOT SCALE: 1 : 20
 CAD REF: 90154-01.dwg
 XREF.
 A3 420 x 297



Existing view of Kowloon Byewash Reservoir



Proposed intake structure
(tentative) at Kowloon
Byewash Reservoir

Tentative view of the proposed intake structure at Kowloon
Byewash Reservoir



Existing view of Lower Shing Mun Reservoir



View of proposed outfall
structure (tentative) at
Lower Shing Mun

Tentative view of the outfall structure at Lower Shing Mun
Reservoir



Proposed outfall structure will be submerged under normal reservoir level

General view of Lower Shing Mun Reservoir



Wooded area may be affected during the construction phase

Proposed location for construction of outfall structure at Lower Shing Mun Reservoir

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Appendix III

Act ID	Description	Orig Dur	Early Start	Early Finish	Year									
					2006	2007	2008	2009	2010	2011	2012	2013	2014	
1000	Feasibility Investigation	200d	16FEB06	03SEP06										
1001	Consultancy Preparation and Funding Arrangement	298d	06JUL06 *	29APR07										
1010	Investigation Stage	485d	30APR07	26AUG08										
1020	EIA Study and Approval	485d	30APR07	26AUG08										
1030	Detailed Design Stage	433d	27AUG08	02NOV09										
1040	Tendering Stage	150d	03NOV09	01APR10										
1050	Construction Stage	974d	02APR10	30NOV12										
1060	Project completion	0		30NOV12										

Start date	16FEB06
Finish date	30NOV12
Data date	16FEB06
Run date	04SEP06
Page number	1A
?Primavera Systems, Inc.	

Inter-reservoir Transfer Scheme

- Early bar
- Progress bar
- Critical bar
- Summary bar
- ◆ Start milestone point
- ◆ Finish milestone point