

# **Drainage Improvement in Big Wave Bay**

## **Project Profile**

**Prepared by : Drainage Services Department**

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## 1. PROJECT INFORMATION

### 1.1 Project Title

The project title is “Drainage Improvement in Big Wave Bay”.

### 1.2 Purpose and Nature of Project

The purpose of the project is to alleviate the current flooding problem at the public carpark of Big Wave Bay by upgrading the existing stormwater drainage system in accordance with the recommendation of the “Stormwater Drainage Master Plan Study in Southern Hong Kong Island”.

### 1.3 Name of Project Proponent

The project proponent is Drainage Services Department (DSD).

### 1.4 Location and Scale of Project

The project site is located at the public carpark of Big Wave Bay in Southern Hong Kong Island. The site history indicates that it was a public carpark and now continues to serve as a carpark. The carpark falls within an area zoned “Green Belt” on the approved Tai Tam and Shek O Outline Zoning Plan No. S/H18/10.

The project comprises the implementation of drainage improvement works for the existing drainage channels at the public carpark as shown on Drawing No. SK-T2-09-019 attached in **Appendix 1**. The site photos regarding the site overview and the connection points of the proposed drainage channel and the existing Big Wave Bay stream are also attached. The scale of the project is detailed in **Table 1.1** below.

**Table 1.1 Scale of Proposed Drainage Works**

Location	Works	Details of Proposed Channel/pipe		
		Approx. Length	Average Base Width	Approx. Depth of Excavation
Along the northern and western side of the public carpark at Big Wave Bay	Construction of new drainage channels and associated catchpits, reconstruction of existing channel	145m	1m	Maximum 1.5m below existing ground
Along the eastern side of the public carpark at Big Wave Bay	Reconstruction of existing dilapidated drainage channel	45m	1m	Maximum 1.5m below existing ground
Along middle of the public carpark at Big Wave Bay	Construction of new drainage channel	35m	0.4m	Maximum 1m below existing ground

### 1.5 Number and Types of Designated Project to be Covered by this Project Profile

The project is defined as designated projects under Item I.1(b)(ii) and (vi), Part I, Schedule 2 of the Environmental Impact Assessment Ordinance.

## 1.6 Name and Telephone Number of Contact Person

Enquiries regarding the project can be addressed to:

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Drainage Services Department

## 2. OUTLINE OF PLANNING AND IMPLEMENTATION PROGRAMME

### 2.1 Planning and Implementation of the Proposed Project

In-house staff of Drainage Services Department will be deployed for the contract management and works supervision of the proposed project. An approved Roads and Drainage civil works contractor will be employed to implement the proposed drainage improvement works.

### 2.2 Project Timetable

The detailed design of the project is completed. The target start date of construction is November 2010 due for completion in February 2011. The tentative project programme is shown in **Table 2.1**.

**Table 2.1 Project Programme**

Activity Description	Month 1	Month 2	Month 3	Month 4
1. Trial Pit	■ ■ ■			
2. Trench Excavation		■ ■ ■ ■ ■		
3. Channel and Catchpit Construction			■ ■ ■ ■ ■	
4. Backfill and Reinstatement				■ ■ ■

### 2.3 Interfacing with Other Projects

No major projects have been identified to be carried out concurrently in the vicinity of the project site and within the project site boundary.

### 2.4 Site Activities Involved

Construction works will be carried out during daytime from 07:00 to 19:00 from Monday to Saturday except Public Holidays. Works will only start when the forecast weather of the coming week is good.

The drainage channels will be constructed by conventional open trench excavation method. Excavation will be carried out in stages by hand-held tools for the proposed new drainage channels. The existing concrete surface of the carpark and the footpath will be broken by hand-held electric breaker powered by silenced generator and excavated by hand-held tools. The excavated material

will be transported off the site by lorry with crane. The trench of excavation will be about 1m wide x 1.5m deep, and the maximum length of each trench will be about 20m. The new channels will be built in traditional cast in-situ concrete. Either precast concrete cover or cast iron grating will be provided for the channels located at the carpark and footpath. The works site will be backfilled, compacted and reinstated to the original condition upon completion of the works.

The existing dilapidated channels will be demolished after the temporary drainage system is set up. The connection of the new drainage channels to the Big Wave Bay Stream will be constructed at the last stage and opened for stormwater flow. A hand-held electric breaker will be used to break down the concrete of the existing channel into small pieces. Lorry with crane will be used for delivery of construction labour, materials and equipment.

During the operation phase, maintenance works will be regular clearance of debris inside the drainage channels and repair of damages to the drainage channels. These works will be minor in nature and will only be undertaken within the immediate vicinity of the drainage channels by manual means.

### **3. MAJOR ELEMENTS OF THE SURROUNDING ENVIRONMENT**

#### **3.1 Noise**

Representative noise sensitive receivers (NSRs) identified within 300m from the project boundary are village houses as shown in the attached Drawing No. SK-T2-09-019 attached in *Appendix 1*. The nearest NSR is located at about 14m to the north-western side of the nearest project boundary.

#### **3.2 Air**

Representative air sensitive receivers (ASRs) identified within 500m from the project boundary include village houses as shown in the attached Drawing No. SK-T2-09-019 attached in *Appendix 1*. The nearest representative ASR is located at about 14m to the north-western side of the nearest boundary and another representative ASR, the Big Wave Bay Beach Office at about 40m to the south.

#### **3.3 Ecology**

The project site itself is adjoining a paved car parking area. However, its vicinity comprises a mix of rural catchment area, village, relatively undisturbed natural terrestrial habitats and natural/man-made intertidal habitats.

Ecological sensitive receivers include the relatively natural intertidal habitats, Coastal Protection Area (CPA) of Big Wave Bay and the Big Wave Bay Stream.

The CPA of Big Wave Bay is situated about 220m to the south-eastern side of the nearest project boundary.

Species of fauna (e.g. fish) and flora (e.g. trees, shrubs) of common interest recorded in and near Big Wave Bay Stream are listed in *Appendix 2*.

#### **3.4 Cultural Heritage**

The project is located in an area which is about 260m from the nearest boundary of an existing cultural heritage, the declared monument of Rock Carving at Big Wave Bay.

### **4. POSSIBLE IMPACTS ON THE ENVIRONMENT**

#### 4.1 Noise

During construction stage, noise will be generated from the powered mechanical equipment (PME) used for the proposed site works. The PMEs likely to be used may include silenced generator, hand-held breaker, compactor, rammer and lorry. Representative NSRs in the vicinity of the improvement works are mainly village houses as shown in Drawing No. SK-T2-09-019.

##### *Construction Noise Criteria*

The construction noise arising from general site activities during normal working hour (i.e. 07:00 to 19:00 on any day not being a Sunday or public holiday) is to be assessed in accordance with the noise criteria as stipulated in **Table 4.1** according to the Environmental Impact Assessment Ordinance – Technical Memorandum (EIAO-TM).

**Table 4.1 EIAO-TM Daytime Construction Noise Standard**

Use	Noise Standard (dB(A))
Domestic Premises	75
Educational Institutions (normal period)	70
Educational Institutions (during examination periods)	65

In general, there would be no construction activities undertaken outside normal working hour. Should night time works be required, the Contractor must apply for a Construction Noise Permit (CNP) and ensure full compliance with the Noise Control Ordinance requirements. The Technical Memorandum on Noise from Construction Work other than Percussive Piling (TM-GW) details the procedures adopted by EPD for assessing such application.

##### *Construction Plants and Activities*

The use of PMEs during the construction phase may affect the NSRs. The major construction activities include trial pit excavation, trench excavation, channel construction, catchpit construction and reinstatement.

To further minimize the noise impact, silenced plant will be employed in the project. The use of quiet plants associated with the construction works and the respective Sound Power Levels (SWLs) is presented in **Table 4.2**.

**Table 4.2 Sound Power Levels of PMEs**

PME	TM Identification	Noise Standard (dB(A))
Lorry with crane	EPD/PME/36	105
Generator, super silenced, 70dB(A) at 7m	CNP 103	95
Breaker, hand-held mass, >10kg and <20kg	CNP 024	108
Compactor, vibratory	CNP 050	105
Power rammer (petrol)	CNP 169	108

##### *Utilization Rate*

To minimize construction noise generated, not all PMEs at each location will be operating at all times. The SWLs presented in **Table 4.2** were applied to the noise impact assessment with the practical utilization rates for various PMEs.

### ***Scheduling of PME***

The construction activities will be planned and carried out in sequence rather than simultaneously at each location. Therefore, only one unit of each equipment should be operated at any one time.

### ***Noise Impact Assessment***

The predicted noise levels due to construction activities are calculated according to the methodology described in TM-GW. The results are summarized in **Table 4.3** and detailed in **Appendix 3**. The assessment indicates that the predicted noise level exceeds the allowable limit under “unmitigated” scenario. The maximum predicted construction level is 79 dB(A) during trial pit excavation, trench excavation and backfill and reinstatement.

**Table 4.3 Predicted Construction Noise Level at the Nearest NSR – “Unmitigated”**

Activity Description	TM-EIAO Criteria, dB(A)	Max. Predicted Noise Level, dB(A)	Exceedance, dB(A)
1. Trial Pit Excavation	75	79	4
2. Trench Excavation	75	79	4
3. Channel and Catchpit Construction	75	74	0
4. Backfill and Reinstatement	75	79	4

It is noted that construction noise arising from the proposed works may pose adverse impact on the nearby villagers that are very close proximity to the work sites. Therefore mitigation measures is recommended and detailed in **Section 5.1**.

During operation phase, only water will be flowing during rainy days and no noise will be generated. During maintenance phase, noise will be generated from clearance of debris and repair of damages to the drainage channels. Such maintenance works are of minor nature with short duration and are generally carried out by manual means. The maintenance works are also confined to the immediate vicinity of the drainage channels. As such, noise impact during operation and maintenance phases are considered negligible.

## **4.2 Air and Dust**

During construction phase, dust will be generated from the demolition of the dilapidated drainage channels, excavation and vehicular movement. However, the impact is expected to be low due to the small scale of works, short duration, limited project area and the small quantity of earthwork and vehicles involved. Exhaust emissions from the electric generator will also be small due to the small number of electric generator deployed on site and the short duration of the demolition work. Water spray will also be adopted to suppress dust. The debris of the demolished drainage channel and the excavated soil will be loaded by manual means onto dump trucks equipped with mechanical cover for disposal.

Through the application of dust control measures and the use of properly maintained equipment, air and dust impacts are considered low.

No dust will be generated during operation phase. A small amount of dust may be generated



during the implementation of maintenance works such as clearance of sediment and debris inside the drainage channels, and during repair of the damaged part of the concrete drainage channels. Such site activities are of minor nature with short duration. The impact on air quality is considered negligible.

#### **4.3 Water**

During construction phase, the proposed drainage channel will be constructed in the dry season. The connections to the existing Big Wave Bay Stream will be constructed at the last stage. Disturbance to the existing bank will be minimized by using sand bags as temporary cofferdam to enable construction. The sand bags will be removed upon completion of works. The existing dilapidated drainage channels will be demolished after temporary drainage system is completed and opened for stormwater flow. All construction works will be carried out in the dry season. The exposed soil surface will be temporarily covered by canvas sheeting to avoid dust and drain away of soil. Hence, the project will not generate additional water and contaminated mud to the environment.

A public toilet with hand washing facilities and 5 shower room is located at the Big Wave Bay Beach, which about 40m from the project site. The scale of the construction is small with short duration. The number of workers is very limited. No temporary toilet, shower, hand washing facilities, kitchen and canteen will be provided during construction. As such, no effluent will be discharged into the existing Big Wave Bay Stream.

Vehicles will make use of the existing hard paved public carpark for temporary parking, loading and unloading. No significant amount of mud or soil material is expected to be brought onto the public road. No wheel washing facilities will be provided for the project. Hence, no contaminated water will be generated from the project.

During operation, the drainage channels will collect and convey the existing stormwater and surface runoff from the public carpark to Big Wave Bay Stream. No additional water will be generated from the project and no contamination to the Big Wave Bay Stream is anticipated.

#### **4.4 Solid Waste**

During construction phase, only a small amount of construction and demolition (C&D) materials such as broken pieces of dilapidated drainage channels, excavation materials, formwork for construction of channels and general refuse will be generated. Most of the C&D materials are inert and will be either re-used or disposed at landfill sites.

No dangerous chemical materials will be involved in the construction works duration.

During operation phase, the drainage channels will generate no solid waste. Catchpits will be provided to collect the sediment and debris in order to avoid blockage of the drainage system and minimize the amount of sediment and debris flowing to Big Wave Bay Stream. As most of the proposed channels are covered channels, waste generated is minimal. Furthermore, maintenance works will be carried out to remove the sediment and debris inside the drainage channels and the broken pieces of the damaged part of the drainage channels. Such waste will be removed by manual means and disposed of immediately after the clearance works. No adverse environmental impacts are anticipated.

#### **4.5 Ecology**

The project will upgrade the existing drainage system to convey the existing stormwater from the public carpark to Big Wave Bay Stream. It will not alter the quantity and nature of the existing stormwater during operation. The flooding problem at the public carpark will be alleviated after

completion of the project.

The new drainage channels will be connected to the Big Wave Bay Stream at its downstream end. The connection works is confined to the immediate vicinity of the drainage channel outlets and will not alter the overall stream bank. The works will be carried out in the dry season. In view of the small scale works with short duration, no impact on the freshwater fauna species and riparian vegetation during construction is anticipated.

During maintenance phase, minor repair works may be carried out at the connection points between the new channel and the bank of the Big Wave Bay Stream. Such minor repair works will be implemented in dry condition. No impact on the freshwater species and riparian vegetation is anticipated.

#### **4.6 Cultural Heritage**

The works will be confined to the immediate vicinity of the public carpark at Big Wave Bay. The project will cause no adverse impact to the existing cultural heritage, the declared monument of Rock Carving at Big Wave Bay at 260m away.

#### **4.7 Landscape and Visual**

During construction phase, the storage of excavated soil, construction plant and materials within construction site will create short term landscape and visual impact. However, the impact is expected to be low due to the small scale of works, short duration, limited project area and the small quantity of earthwork and plant involved.

No trees will be felled and transplanted during implementation of the project. No compensatory planting is required.

During the operation phase, the drainage will be adjoining a paved Big Wave Bay car parking area at ground surface. There will be no landscape and visual impact.

#### **4.8 Others**

##### **4.8.1 Odour**

No odour impacts will be generated by the project.

##### **4.8.2 Night-time Operations**

All construction and maintenance works will be carried out during daytime from Monday to Saturday. No works will be implemented at night time and on Sunday and Public Holidays.

##### **4.8.3 Dangerous Goods/ Hazardous Materials**

No dangerous goods and hazardous materials will be involved in this project.

### **5. ENVIRONMENTAL PROTECTION MEASURES**

#### **5.1 Noise**

The implementation of good site practices and nuisance avoidance measures will significantly reduce noise emissions from construction activities. General requirements for noise control as

stated in the EPD's Recommended Pollution Control Clauses for Construction Contracts are listed below:

- i.) The Contractor shall observe and comply with the Noise Control Ordinance and its subsidiary regulations;
- ii.) The Contractor shall ensure that all plant and equipment to be used on the site are properly maintained in good operating condition and noisy construction activities shall be effectively sound-reduced by means of silencers, mufflers, acoustic linings or shields, acoustic sheds or screens or other means, to avoid disturbance to any nearby noise sensitive receivers;
- iii.) For carrying out any construction work other than percussive piling during the time period from 0700 to 1900 hours on any day not being a general holiday (including Sundays), the Contractor shall comply with the following requirements:
  - a) The noise level measured at 1m from the most affected external façade of the nearby noise sensitive receivers from the construction works alone during any 30 minute period shall not exceed an equivalent sound level (Leq) of 75dB(A);
  - b) Should the limits stated in the above sub-clause(a) be exceeded, the construction shall stop and shall not re-commence until appropriate measures acceptable to the Engineer that are necessary for compliance have been implemented; and
  - c) The Contractor shall adopt, where necessary, the use of quiet construction equipment and/or shall employ the quietest practicable working methods when carrying out demolition works during restricted hours.
- iv.) Before the commencement of any work, the Engineer may require the methods of working, plant equipment and sound-reducing measures to be used on the site to be made available for trial demonstration inspection and approval to ensure that they are suitable for the project;
- v.) The Contractor shall devise, arrange methods of working and carry out the works in such a manner so as to minimize noise impacts on the surrounding environment, and shall provide experienced personnel with suitable training to ensure that these methods are implemented;
- vi.) Notwithstanding the requirements and limitations set out in Clause iii) above and subject to compliance with Clauses ii) and v) above, the Engineer may upon application in rewriting by the Contractor, allow the use of equipment and the carrying out of any construction activities for any duration provided that he is satisfied with the application which, in his opinion, is considered to be of absolute necessity and adequate noise insulation has been provided to the schools to be affected, or of emergency nature, and not in contravention with the Noise Control Ordinance in any respect;
- vii.) The Contractor shall, when necessary, apply for a construction noise permit in accordance with the Noise Control (General) Regulations prior to the commencement of the relevant parts(s) of the works, display the permit as required and provide a copy to the Engineer; and
- viii.) Measures that are to be taken to protect adjacent noise sensitive receivers, if necessary, shall include, but not be limited to, adequate noise barriers. The barriers shall be of substantial construction and designed to reduce transmission of noise. The location and details of the barriers shall be submitted to the Engineer for approval before works commence adjacent to schools and other noise sensitive receivers.

The following site practices and measures shall be adopted for all construction activities involving the use of PME:

- i.) All machines and plant that may be in intermittent use shall be shut down between work periods or be throttled down to a minimum;
- ii.) Plant that is expected to emit noise strongly in one direction shall, where possible, be orientated so that the noise is directed away from nearby receivers;
- iii.) Mobile plant shall be sited as far away from receivers as possible;
- iv.) Material stockpiles and other structures shall be effectively utilized to screen noise from on-site construction activities;
- v.) Temporary noise barriers shall be provided; and
- vi.) Limitation on the use of PME at any one time for any one construction activity at any one location.

### **Noise Impact Assessment**

With the provision of the above good site practices and mitigation measures for all construction activities, the noise impact assessment is carried out under the “mitigated” scenario is presented in **Table 5.1** and detailed in **Appendix 3**. The provision of the movable noise barriers during operation of the PMEs, a 5dB(A) reduction of noise level can be applied in the assessment. The predicted noise levels comply with the noise criteria in **Table 4.1**.

**Table 5.1 Predicted Construction Noise Level at the Representative NSR – “Mitigated”**

Activity Description	TM-EIAO Criteria, dB(A)	Max. Predicted Noise Level, dB(A)	Exceedance, dB(A)
1. Trial Pit Excavation	75	74	0
2. Trench Excavation	75	74	0
3. Channel and Catchpit Construction	75	69	0
4. Backfill and Reinstatement	75	74	0

## **5.2 Air and Dust**

General requirements for air pollution control as stated in the EPD’s Recommended Pollution Control Clauses for Construction Contracts are listed below:

- i.) The Contractor shall observe and comply with the Air Pollution Control Ordinance and its subsidiary regulations, particularly the Air Pollution Control (Construction Dust) Regulation.
- ii.) The Contractor shall undertake at all times to prevent dust nuisance and smoke as a result of his activities;
- iii.) The Contractor shall ensure that there will be adequate water supply/storage for dust suppression;

- iv.) The Contractor shall devise, arrange methods of working and carrying out the works in such a manner so as to minimize dust impacts on the surrounding environment, and shall provide experienced personnel with suitable training to ensure that these methods are implemented; and
- v.) Before the commencement of any work, the Engineer may require the methods of working, plant, equipment and air pollution control system to be used on the site to be made available for inspection and approval to ensure that they are suitable for the projects.

The following good construction practices are recommended to be adopted on-site to minimize potential air quality impacts from dust emissions:

- i.) Use of regular watering (at least twice daily) to reduce dust emissions from exposed site surfaces, particularly during dry weather;
- ii.) Side enclosure and covering of any aggregate or dusty material stockpiles to reduce emissions. Where this is not practicable owing to frequent usage, watering shall be employed to aggregate fines; and
- iii.) Tarpaulin covering of all dusty vehicle loads transported to and from site locations.

### **5.3 Water**

The Contractor shall observe and comply with the Water Pollution Control Ordinance and its subsidiary regulations. The Contractor shall carry out the works in such a manner as to minimize adverse impacts on the water quality during execution of the works. In particular he shall arrange his method of working to minimize the effects on the water quality within and outside the site and on the transport routes.

Proper site management measures shall be implemented to control site runoff and drainage, and thereby prevent high sediment loadings from reaching downstream sections of the river/stream and adjacent agricultural land, if any. The Contractor shall follow the practices, and be responsible for the design, construction, operation and maintenance of all the mitigation measures. The design of the mitigation measures shall be submitted by the Contractor to the Engineer for approval. These mitigation measures shall include the following practices to minimize site surface runoff and the chance of erosion, and also to retain and reduce any suspended solids prior to discharge:

- i.) Before commencing any site formation work, all sewer and drainage connections shall be sealed to prevent debris, soil, sand etc. from entering public sewers/drains;
- ii.) Provision of perimeter channels to intercept storm-runoff from outside the site. These shall be constructed in advance of site formation works and earthworks;
- iii.) Temporary ditches such as channels, earth bunds or sand bag barriers shall be included to facilitate runoff discharge into the stormwater drain, via a sand/silt basin/trap;
- iv.) Works programme shall be designed to minimize works areas at any one time, thus minimizing exposed soil areas and reducing the potential for increased siltation and runoff;
- v.) Sand/silt removal facilities such as sand traps, silt traps and sediment basins shall be provided to remove the sand/silt particles from run-off where necessary. These facilities shall be properly and regularly cleaned and maintained. These facilities shall be carefully planned to ensure that they would be installed at appropriate locations to capture all surface water generated on site;

- vi.) Careful programming of the works to avoid excavation works during the rainy season;
- vii.) Temporary access roads (if any) shall be protected by crushed gravel and exposed slope surfaces shall be protected when rainstorms are likely; and
- viii.) Open stockpiles of construction materials on-site shall be covered with tarpaulin or similar fabric during rainstorms to prevent erosion.

The use of containment structures and diversion channels is recommended wherever practicable to facilitate a dry or at least confined excavation within watercourses. By limiting or confining the works areas the extent of disturbance to the surrounding water bodies will be significantly reduced, and thus resulting impacts on water quality from sediment resuspension will be reduced. Furthermore, excavation works would be carried out during periods of low flow (dry season) to minimize impacts on downstream water quality and sensitive receivers.

The Contractor shall not discharge directly or indirectly or cause or permit or suffer to be discharged into any public sewer, stormwater drain, channel, stream-course or sea any trade effluent or foul or contaminated water or cooling or hot water without the prior written consent of the Engineer in consultation with the Director of Environmental Protection and Director of Water Supplies, who may as a condition of granting his consent require the Contractor to provide, operate and maintain at the Contractor's own expense to the satisfaction of the Engineer suitable works for the treatment and disposal of such trade effluent or foul or contaminated or cooling or hot water.

#### **5.4 Solid Waste**

The Contractor shall observe and comply with the Waste Disposal Ordinance and its subsidiary regulations. Requirements with respect to waste management as stated in the EPD's Recommended Pollution Control Clauses for Construction Contracts are given below:

- i.) The Contractor shall minimize the generation of waste from his work. Avoidance and minimization of waste generation can be achieved through changing or improving design and practices, careful planning and good site management;
- ii.) The Contractor shall ensure that different types of wastes are segregated on-site and stored in different containers, skips or stockpiles to facilitate reuse/recycling of waste and, as the last resort, disposal at different outlets as appropriate;
- iii.) The reuse and recycling of waste shall be practiced as far as possible. The recycled materials shall include paper/cardboard, timber and metal etc;
- iv.) The Contractor shall ensure that Construction and Demolition (C&D) materials are sorted into public fill (inert portion) and C&D waste (non-inert portion). The public fill which comprises soil, rock, concrete, brick, cement plaster/mortar, inert building debris, aggregates and asphalt shall be reused in earth filling or site formation works. The C&D waste which comprises metal, timber, paper, glass, junk and general garbage shall be reused or recycled and, as the last resort, disposal of at landfills;
- v.) The Contractor shall record the amount of wastes generated, recycled and disposed of (including the disposal sites);
- vi.) The Contractor shall use a trip ticket system for the disposal of C&D materials and/or C&D waste to any designated public filling facility and/or landfill respectively; and
- vii.) Training shall be provided for workers about the concepts of site cleanliness and appropriate waste management procedure, including waste reduction, reuse and recycling.

## **5.5 Ecology**

Measures that are likely to be required for mitigating the potential ecological impact would include:

- i.) Drainage improvement works at stream-courses should avoid impacts to natural stream and riparian habitats where possible. Should such impacts prove unavoidable, affected areas should be re-instated following the completion of works.
- ii.) The drainage channels will be aligned with the shortest length as far as practicable without adverse impact to the existing trees and plants.
- iii.) Works within or close to natural stream-courses should be conducted in the dry season, with construction carried out by land-based plant. Any excavation works should be restricted to an enclosed dry section of the stream, with containment measures such as bunds and barriers used within the stream to minimize impacts to communities downstream of the works area. Site runoff should be directed towards regularly cleaned and maintained silt traps and oil/grease separators to minimize the risk of sedimentation and pollution of stream water.
- iv.) Noise mitigation measures including the use of quiet construction plant and temporary noise barriers should be implemented to minimize disturbance to habitats adjacent to the works areas.
- v.) Standard good site practice measures should be implemented throughout the construction phase. The measures should include:
  - a) Placement of equipment or stockpile in designated works areas and access routes selected on existing disturbed land to minimize disturbance to natural or moderate-high ecological value habitats;
  - b) Construction activities should be restricted to work areas that should be clearly demarcated. The work areas should be reinstated after completion of the works;
  - c) Waste skips should be provided to collect general refuse and construction wastes. The wastes should be disposed of timely and properly off-site;
  - d) General drainage arrangements should include sediment and oil traps to collect and control construction site run-off; and
  - e) Open burning on works sites is illegal, and should be strictly prohibited.

## **5.6 Landscape and Visual**

Implement good site practice such as site cleanliness, tidiness, proper storage of construction material, canvas covering of the construction material and site area, proper fencing, protection measures to the existing trees, minimize site area and, removal of debris immediately after construction and reinstatement of site area.

## **6. ENVIRONMENTAL AUDITING**

To ensure implementation of the above recommended mitigation measures, monthly environmental audit will be undertaken by qualified professional and confirm to EPD implementation of the measures during the construction period. In-house site staff will be deployed full-time to supervise implementation of the measures.

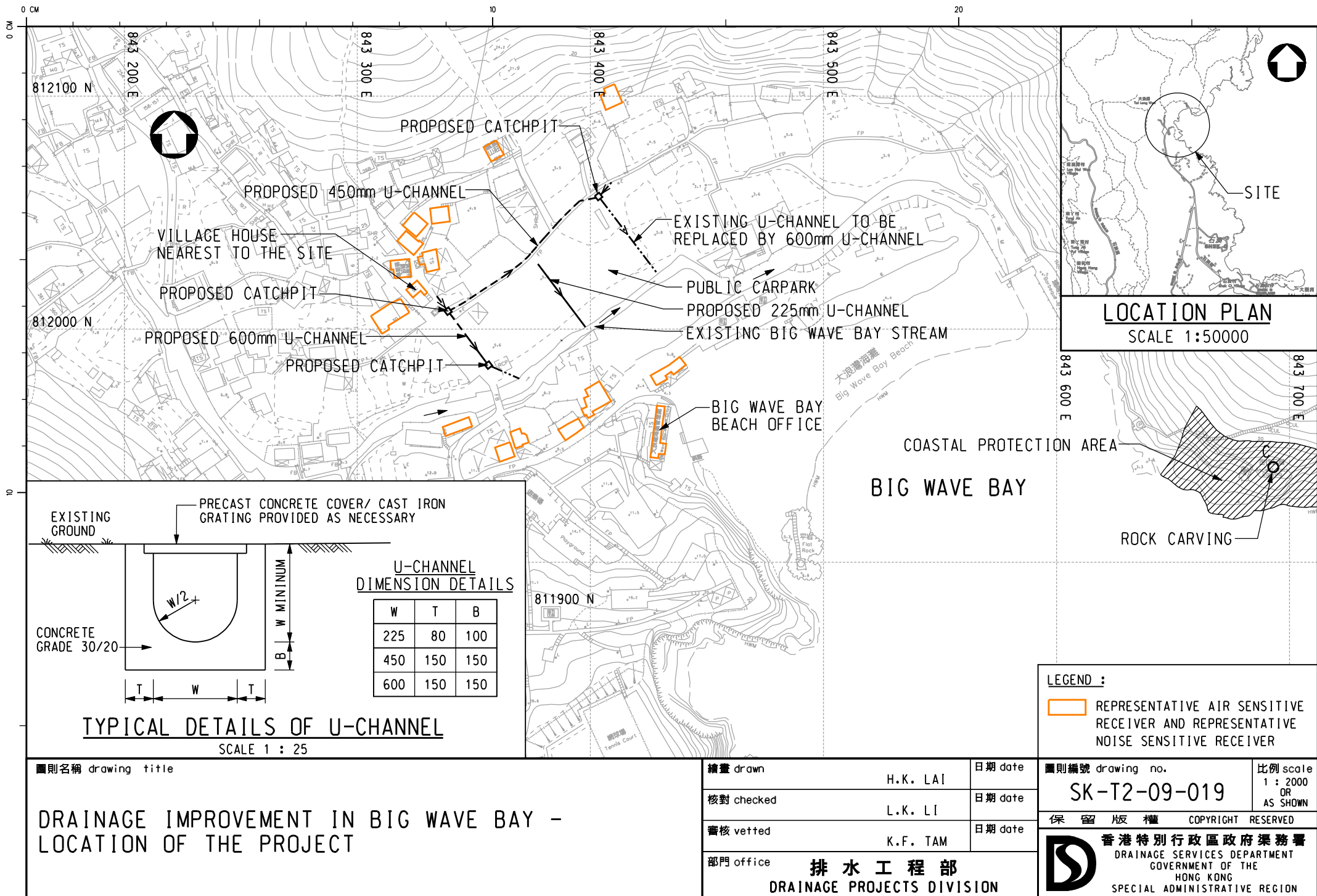
**7. PREVIOUSLY APPROVED SIMILAR ENVIRONMENTAL ASSESSMENTS**

No previous EIA report has been approved or submitted for the project.

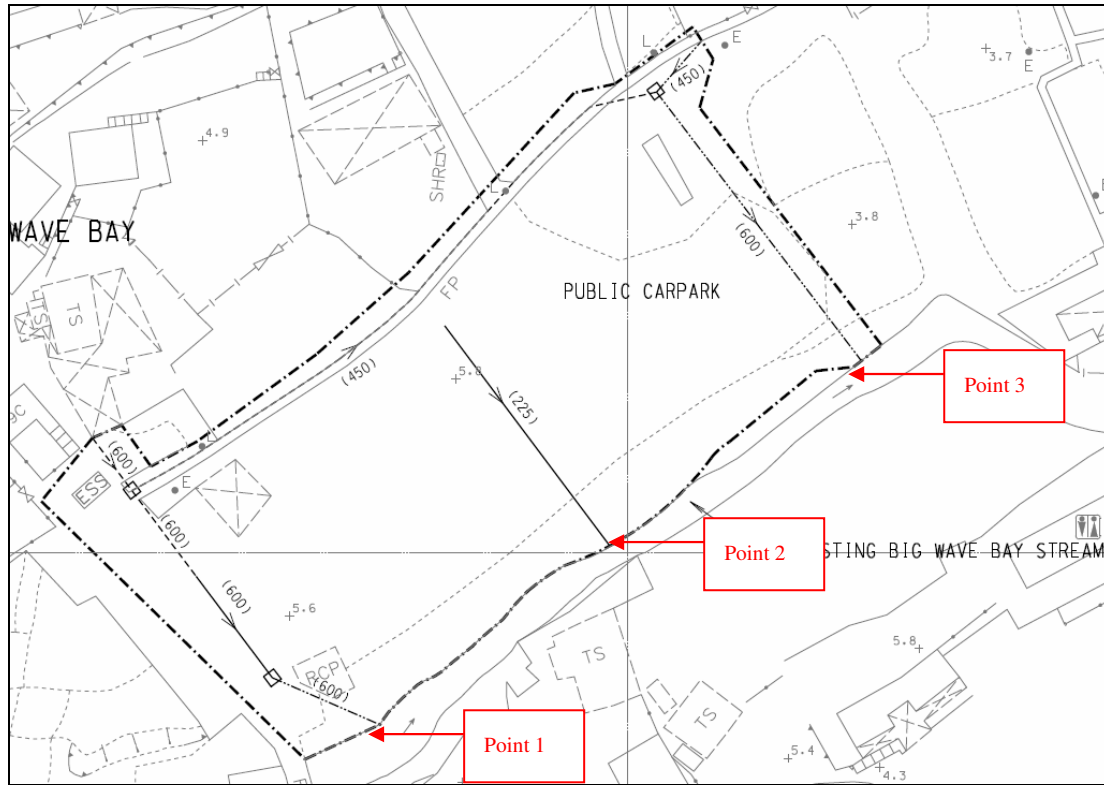
**8. CONCLUSIONS**

The environmental impacts of the project are unlikely to be adverse and the mitigation measures proposed above meet the requirements of the Technical Memorandum on Environmental Impact Assessment Process. As such, DSD is applying directly for an Environmental Permit under Section 5(11) of the EIAO.





**DRAINAGE IMPROVEMENT IN BIG WAVE BAY**



**Layout Plan**

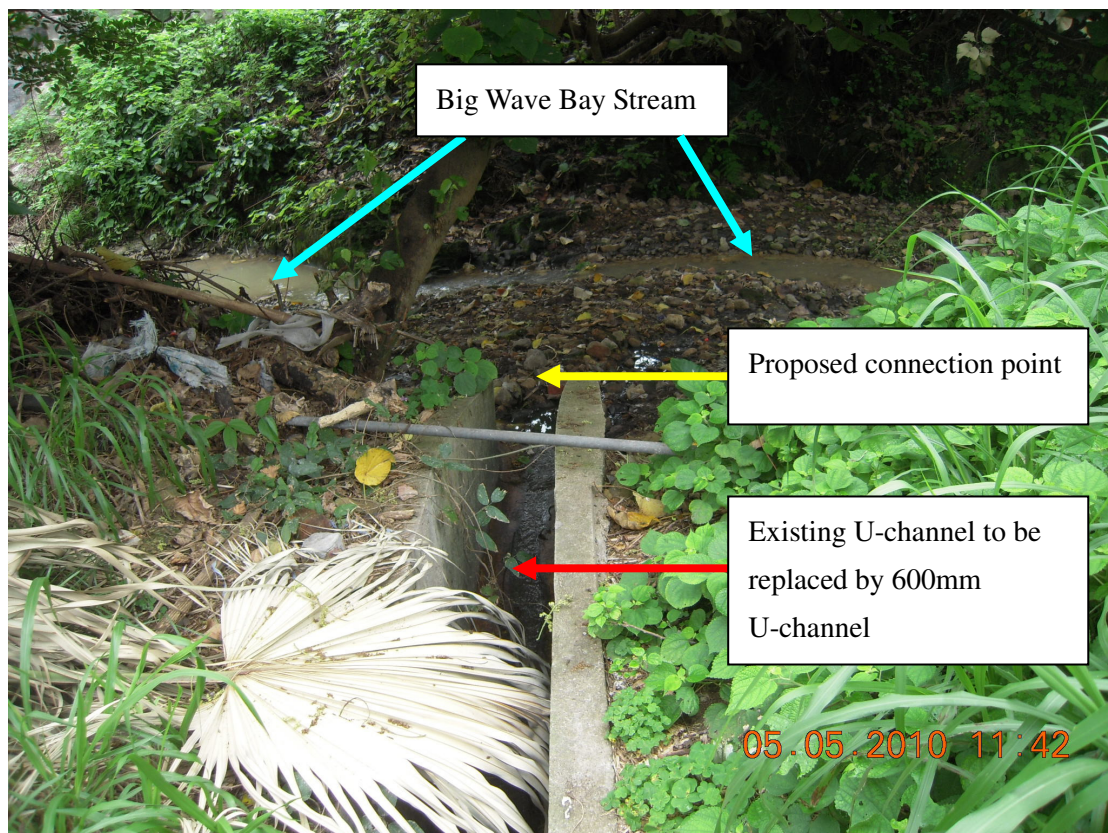


**Overview 1**



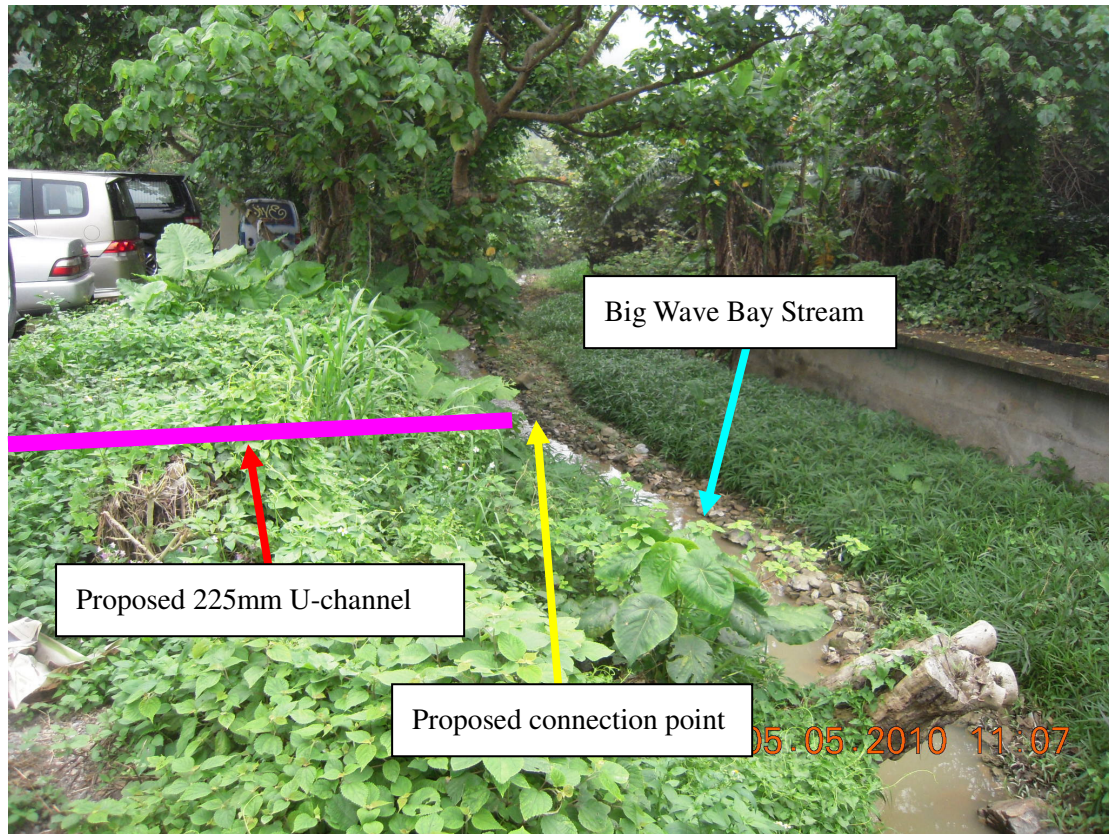


**Overview 2**

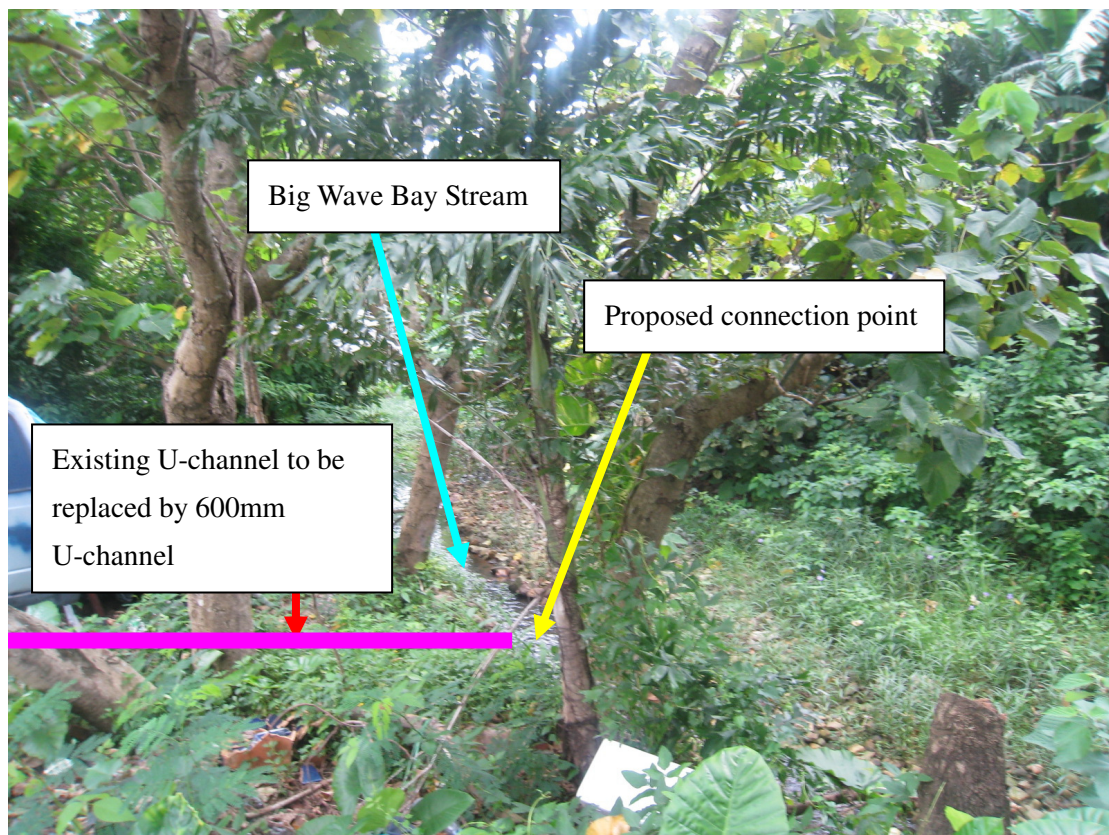


**Connection Point 1**





**Connection Point 2**



**Connection Point 3**

## Species of Fauna (e.g. Fish) and Flora (e.g. Plant) in and near Big Wave Bay Stream

### Part A. Fish Species recorded at Big Wave Bay Stream

*Oreochromis niloticus*  
*Poecilia reticulata*  
*Gambusia affinis*  
*Oreochromis mossambicus*  
*Rhinogobius duospilus*  
*Schistura fasciolata*  
*Eleotris oxycephala*  
*Xiphophorus variatus*

### Part B. Plant species recorded in the vicinity of the car park next to Big Wave Bay Stream

*Annona squamosa*  
*Archontophoenix alexandrae*  
*Araucaria heterophylla*  
*Averrhoa carambola*  
*Boehmeria nivea*  
*Carica papaya*  
*Caryota ochlandra*  
*Celtis sinensis*  
*Delonix regia*  
*Dimocarpus longan*  
*Ficus benjamina*  
*Ficus hispida*  
*Ficus microcarpa*  
*Hibiscus rosa-sinensis*  
*Hibiscus tiliaceus*  
*Leucaena leucocephala*  
*Litchi chinensis*  
*Macaranga tanarius*  
*Michelia alba*  
*Morus alba*  
*Musa* sp.  
*Osmanthus fragrans*  
*Phoenix roebelenii*  
*Psidium guajava*  
*Ravenala madagascariensis*  
*Salix babylonica*  
*Schefflera octophylla*  
*Sterculia lanceolata*

**Project Title : Drainage Improvement in Big Wave Bay**  
**Subject : Noise Impact Assessment**

**Appendix 3**

Activity Description / PME	TM Identification	No. of Unit	% On-time	Unit SWL	SWL	Total SWL	Distance Corr, dB(A)	Façade Corr, dB(A)	Max. Predicted Noise Level, dB(A) (Unmitigated)	Noise Reduction, dB(A)	Max. Predicted Noise Level, dB(A) (Mitigated)
1. Trial Pit Excavation											
1.1 Lorry with crane	EPD/PME/36	1	30	105	101						
1.2 Generator, super silenced, 70dB(A) at 7m	CNP 103	1	50	95	92						
1.3 Breaker, hand-held mass, >10kg and <20kg	CNP 024	1	50	108	105						
						107	-31	3	79	-5	74
2. Trench Excavation											
2.1 Lorry with crane	EPD/PME/36	1	30	105	101						
2.2 Generator, super silenced, 70dB(A) at 7m	CNP 103	1	50	95	92						
2.3 Breaker, hand-held mass, >10kg and <20kg	CNP 024	1	50	108	105						
						107	-31	3	79	-5	74
3. Channel and Catchpit Construction											
3.1 Lorry with crane	EPD/PME/36	1	30	105	101						
3.2 Generator, super silenced, 70dB(A) at 7m	CNP 103	1	50	95	92						
						102	-31	3	74	-5	69
4. Backfill and Reinstatement											
4.1 Compactor, vibratory	CNP 050	1	50	105	102						
4.2 Power rammer (petrol)	CNP 169	1	50	108	105						
						107	-31	3	79	-5	74