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# Floral Transplantation Plan

Contract No. DPW 01/2020 Environmental Team for Drainage Improvement Works at Ngong Ping

0118/20/ED/0223e 05 | 11 December 2020

Formal Submission

**Drainage Services Department**

# Document Control

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## Abbreviations

AFCD	Agriculture, Fisheries and Conservation Department
DSD	Drainage Services Department
EIA	Environmental Impact Assessment
EIAO	Environmental Impact Assessment Ordinance
EM&A	Environmental Monitoring and Audit
EP	Environmental Permit
EPD	Environmental Protection Department
ET	Environmental Team
FTS	Fugro Technical Services Limited
IEC	Independent Environmental Checker

# 1. Introduction

## 1.1 Background

- 1.1.1 To enhance the capacity of the trunk drainage system and reduce the flood risk in Ngong Ping, long term drainage improvement works are proposed to be implemented under "PWP Item No. 4163CD – Drainage Improvement Works at Ngong Ping" (hereafter referred to as "the Project").
- 1.1.2 The Project is a designated project under Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO) (Cap.499). An Environmental Impact Assessment (EIA) Report together with an Environmental Monitoring and Audit (EM&A) Manual (hereafter referred to as the "approved EM&A Manual") (Register No. AEIAR-169/2013) was prepared for the Project and approved by Environmental Protection Department (EPD) on 21 April 2013. An Environmental Permit (EP) was first issued on 7 August 2013 and its current version (EP No. EP-456/2013/A) as issued on 29 March 2019. These documents are available through the EIAO Register.
- 1.1.3 Fugro Technical Services Limited (FTS) has been appointed as the Environmental Team (ET) by Drainage Services Department (DSD) to implement the EM&A programme in accordance with the EP No. EP-456/2013/A and the approved EM&A Manual. As the ET, part of the scope of FTS, is to prepare and submit a Floral Transplantation Plan (hereafter referred to as the "Plan").

## 1.2 Purpose of the Plan

- 1.2.1 Consistent to the **EM&A Requirements items 6, 7 and 8 of Table 5.2 of the EM&A Manual Section 5.5.2.1**, Preparation of Floral Transplantation Plan and Floral Transplantation Works shall be prepared and implemented during the pre-construction phase of the Project before any construction works commence, while Audit of the Transplantation Works shall be done during the construction phase of the Project. As per **EP Condition 2.8** the Floral Transplantation Plan shall be deposited with the Director at least one month before commencement of construction works after it has been certified by the ET Leader and verified by the IEC as conforming to the information and recommendations contained in EIA Report.
- 1.2.2 Based upon the findings of the "Updated Baseline Vegetation Survey", each of the floral species with conservation interest that cannot be preserved in-situ due to Project's construction activities shall be transplanted as described in **EIA Section 6.12.2.14 and Sections 5.5.2.6 and 5.5.2.12 of the approved EM&A Manual**.
- 1.2.3 As a necessary construction mitigation procedure, this Plan was prepared and submitted by the qualified ecologist of the ET to detail each of the floral species with conservation interest and their numbers to be transplanted; the methodology for the Floral Transplantation Works (hereafter referred to as the "Transplantation Works"); the programme; and the proposed reception sites as required on **EIA Section 6.12.2.14**.



### 1.3 Relevant Legislations, Standards, Guidelines and Criteria

This Plan was prepared and shall be undertaken in accordance with the guidelines, standards, documents, government ordinances and regulations as described below:

- *Country Parks Ordinance (Cap. 208)*. Provides for the designation and management of country parks and special areas. Country parks are designated for the purpose of nature conservation, countryside recreation and outdoor education. Special Areas are created mainly for the purpose of nature conservation;
- *Environmental Impact Assessment Ordinance (EIAO) (Cap. 499)*. An ordinance for assessing the impact on the environment of certain projects and proposals, for protecting the environment and for incidental matters;
- *EIAO Technical Memorandum Annexes 8 and 16*. Ecological assessment specific annexes which provide the criteria for evaluating ecological impact and guidelines for ecological assessment, respectively;
- *EIAO Guidance Notes No.7/2010 and 10/2010*. Guidance notes on the general guidelines for conducting an ecological baseline survey for ecological assessment and on some methodologies in conducting terrestrial and freshwater ecological baseline surveys, respectively;
- *Forests and Countryside Ordinance (Cap. 96)*. An ordinance which prohibits felling, cutting, burning or destroying of trees and growing plants in forests and plantations on Government land. Related subsidiary Regulations prohibit the selling or possession of listed restricted and protected plant species;
- *Hong Kong Planning Standards and Guidelines Chapter 10 (HKPSG)*. Covers planning considerations relevant to conservation. This chapter details the principles of conservation, the conservation of natural landscape and habitats, historic buildings, archaeological sites and other antiquities. It also addresses the issue of enforcement. The appendices list the legislation and administrative controls for conservation, other conservation related measures in Hong Kong and government departments involved in conservation;
- *Hong Kong Planning Standards and Guidelines (HKPSG) Chapter 10 "Conservation"*. Provides landscape and conservation guidelines to achieve a balance between the need for development and the need to minimise disruption of the landscape and natural resources;
- *Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) and its subsidiary legislation*. Regulates the import, introduction from the sea, export, reexport, and possession of specimens of a scheduled species, including live, dead, parts or

derivatives. The Ordinance applies to all activities involving endangered species which include the parties of traders, tourists and individuals;

- *The IUCN Red List of Threatened Species*. Widely recognised as the most comprehensive, objective global approach for evaluating the conservation status of plant and animal species. Provides information and analyses on the status, trends and threats to species in order to inform and catalyse action for biodiversity conservation;
- *Town Planning Ordinance (Cap. 131)*. Provides for the designation of coastal protection areas, Sites of Special Scientific Interest (SSSIs), Conservation Area, Country Park, Green Belt or other specified uses that promote conservation or protection of the environment; and
- *United Nations Convention on Biodiversity (1992)*. Requires signatories to make active efforts to protect and manage their biodiversity resources. Hong Kong Government has stated that it will be 'committed to meeting the environmental objectives' of the Convention.

## 1.4 Structure of the Plan

1.4.1 Succeeding Section 1 Introduction, the remainder of this Plan is presented as follows:

- Section 2 details the methodology of the Transplantation Works;
- Section 3 describes the proposed receptor sites;
- Section 4 describes the post-transplantation maintenance;
- Section 5 describes the audit of transplantation works;
- Section 6 details the compensatory planting (if will be necessary); and
- Section 7 details the transplantation and audit works programme.



## 2. Methodology

This section presents the methodology and approach of the Transplantation Works during the pre-construction phase of the Project as recommended by **EM&A Manual Section 5.5.2.1**. All individuals considered for transplantation works are with good health and with anticipated high-post transplantation survival rate, hence, no alternative compensatory planting will be conducted during this Project phase as otherwise required by **EM&A Manual Section 5.5.2.12**.

### 2.1 Personnel

The Transplantation Works shall be conducted by a qualified ecologist whose qualification was certified by the ET Leader and verified by the IEC as described in **EP Conditions 2.3 and 2.8**. The qualified ecologist shall be supported by a team of experienced ecologists as part of the ET.

### 2.2 Existing Locations of Floral Species with Conservation Interest to be Transplanted

Individuals of the two floral species of conservation interest including Eurya-leaved Camellia *Camellia euryoides* and Mrs. Farrer's Rhododendron *Rhododendron farrerae* are considered for transplantation works as they will be directly affected by the construction of Outfall B. Individuals of *C. euryoides* are located along the rocky banks of Ngong Ping stream behind the columbarium within the shrubland area in addition to *R. farrerae* individuals which are also distributed in the hillside area of the shrubland adjacent to the stream (**Appendix A.1 and B.1 to B.6**).

### 2.3 Species and Actual Numbers

The very common *C. euryoides* (Xing et al., 2000) is protected under the Forests and Countryside Ordinance (Cap. 96A). Its seven shrub individuals (B28 to B34) have diameter at breast height (DBH) that range from 0.01 to 0.03m.; height range from 0.90 to 2.20m; and crown spread with range of 0.60 to 1.40m (**Table 2.1**).

Another species, the common *R. farrerae* (Xing et al. 2000) as also protected by Cap. 96A, has five shrub individuals (I12 to 14; I29 and I31) for transplantation works. Individual DBH range from 0.02 to 0.15m; height that range from 0.90 to 1.70m and crown spread which range from 0.80 to 1.20m.

Table 2.1: Species of Conservation Interest Measurements

Species	Diameter at Breast Height (DBH) (m)	Height (m)	Species Crown Spread (m)
<i>Camellia euryoides</i> individuals			
B28	0.03	2.20	1.40
B29	0.03	1.60	1.30
B30	0.01	1.30	1.00
B31	0.02	1.20	0.80
B32	0.02	1.90	1.00

Species	Diameter at Breast Height (DBH) (m)	Height (m)	Species Crown Spread (m)
B33	0.02	1.70	1.20
B34	0.01	0.90	0.60
<i>Rhododendron farrerae</i> individuals			
I12	0.04	1.35	0.80
I13	0.02	0.90	0.85
I14	0.15	1.70	1.20
I29	0.02	1.30	0.80
I31	0.03	1.40	1.10

## 2.4 Floral Transplantation Works Procedures

All these twelve individuals shall be transplanted. Below subsections shall be adopted during the transplantation works.

### 2.4.1 Modified Bareroot (MB)

All seven *C. euryoides* individuals, growing on a rocky substrate with most of their lateral roots and root hairs exposed on the substrate surface shall be removed by modified bareroot. After digging the trench (if any), the soil on the lateral roots shall be partially washed-off with water to minimize injury during removal from the substrate. However, to provide some protection to the rest of the root system and help them recover more rapidly, they will be prepared "semi-bare" such that significant amount of soil shall be left clinging to the roots. Soil substrate removal from the roots shall only be minimally done and as far as practicable.

Any tap root or anchor root that still holds at a depth beyond 12 inches shall be cut off. To lift each individual shrub out of the hole, each shall be grasped at the base of its trunk, close to the soil line. The root collar of each plant shall be marked before transplanting to ensure subsequent planting at an appropriate depth at the receptor site such that the finish level shall be 1 inch below the marked collar level to allow plant settlement. The roots shall be kept moist by wrapping it in plastic or wet paper (Shaughnessy et al., 1999) until immediately transplanted to the receptor site within the same day.

### 2.4.2 Root ball

All five *R. farrerae* individuals shall be removed through root ball. The root ball to shrub diameter shall be 10:1 (GLTMSDB, 2014) with depth of 12 inches. Rhododendrons have generally shallow root system (McNeilan, 2001) such that this proposed depth shall be enough to encompass individual's sufficient roots as necessary for their establishment at the receptor sites. Root ball cuts shall be made clean to avoid tearing or breaking the roots. All cut roots shall be trimmed cleanly back to the healthy tissues to reduce the split and torn roots. Root ends shall be cut sharply to promote a flush of new fibrous roots, helping the individuals recover faster from injuries (GLTMSDB, 2014). The full circumference of root balls shall then be wrapped with damp hessian to maintain moisture during the transplantation process.

## 2.4.3 Transplanting

### 2.4.3.1 Modified bareroot individuals

Each MB plant individual shall be transplanted to the receptor sites in the morning immediately after the collection process to reduce stress of being subjected to direct sunlight on later time of the day. Each shall be inserted to the hole with 50% wider width than its root system such that its roots can be fully expanded and arranged in their natural position. It shall be made sure that roots will neither be in crowded and twisted orientation; nor arranged in a circle against the wall of the hole or all in one direction as roots improperly arranged at planting can result in slow growth or even the death of the individuals after a few years. To prevent unnecessary settling of the plant, the center portion of the bottom area of the hole shall be elevated higher than the edges. The mound height shall be determined by placing the plant on the mound so that the pre-marked portion of the root collar is an inch above the soil line of the planting hole (GLTMSDB, 2014). While holding each individual at the center of the hole, the subsoil shall be added while fingers are gently working among the roots and firming the soil to eliminate air pockets. After all the subsoil has been returned back to the hole, water the soil with a half-gallon per square foot of the substrate. Once the water has drained (settling the soil and eliminating air pockets), the topsoil shall be added and be lightly tamped upon with foot. After this, the topsoil shall be watered for it to settle as well (Shaughnessy et al., 1999).

### 2.4.3.2 Root-balled individuals

Similar with MB, each root-balled individual shall also be transplanted to the receptor sites in the morning immediately after the collection process to reduce stress of being subjected to direct sunlight on later time of the day. Root ball supporting material such as the damp hessian shall be removed from the root ball prior to final back filling. The back-fill soil shall be reinstated and settled in layered sections to limit future settling and prevent air pockets. It shall not be compacted to a density that inhibits root growth, however, it shall be tamped firmly around the base to stabilise each shrub individual, but the rest of the soil should be tamped only lightly, or left to settle on its own. Water shall be added to the root ball and the backfill to bring the root ball to field capacity and when finally set, the top surface of the root ball shall not be below the surrounding soil (GLTMSDB, 2014).

## 3. Receptor Sites

Prior to the commencement of construction activities, all 12 individuals shall be transplanted to suitable habitats. The proposed receptor sites (**Appendix A.1, C.1 and C.2**) for both species were selected due to its close proximity from the collection site in order to provide consistent habitat characteristics to allow quick adaptation of the plants. The proposed receptor sites for *C. euryoides* individuals are located at the fringe area of the adjacent secondary woodland; approximately 30 to 40m away from the collection sites and currently support several individuals of the species along the riparian area of the nearby stream. Meanwhile, the proposed receptor sites for *R. farrerae* are situated around 20 to 30m away from its collection sites and also currently support several individuals of the species.

### 3.1 Preparation of Receptor Sites

Receptor sites shall be prepared prior to transplantation works.

#### 3.1.1 Site Clearance

Before the transplantation works, site clearance for rubbish, litter, stones exceeding 25mm diameter and all deleterious material shall be removed from the surface of the ground and the soil for planting; and overgrown weeds shall be removed (Mott McDonald Hong Kong Ltd., 2010).

#### 3.1.2 Pit Preparation

Planting pits shall be prepared according to the two types of transplantation methods.

##### 3.1.2.1 Modified Bareroot

Relative to the rocky substrate where *C. euryoides* individuals grow, MB is a more preferred method for transplantation as rootball cuts cannot be made on the specified substrate type. For the receptor sites, seven pits individually labelled as B28 to B34 (**Appendix C.1**) shall be dug with hole 50 percent wider than the root system of each MB plants. When digging, the topsoil (the top 6-inch layer) shall be placed in one pile and the subsoil in a separate pile. The two layers shall be separated as these will also be separately returned back to the pit during the transplantation works. The reuse of soil layers shall avoid a distinct interface between the planting pits and the surrounding soil (GLTMSDB, 2014; Shaughnessy et al., 1999).

##### 3.1.2.2 Root ball

Five pits labelled as I12 to I14; I29 and I31 (**Appendix C.2**) shall be dug with hole three times the root ball diameter at the surface (**Figure 3.1**) as roots grow vigorously near the surface (dotted line) (Watson and Himelick, 1997), while depth shall not exceed the depth of the root ball (GLTMSDB, 2014).

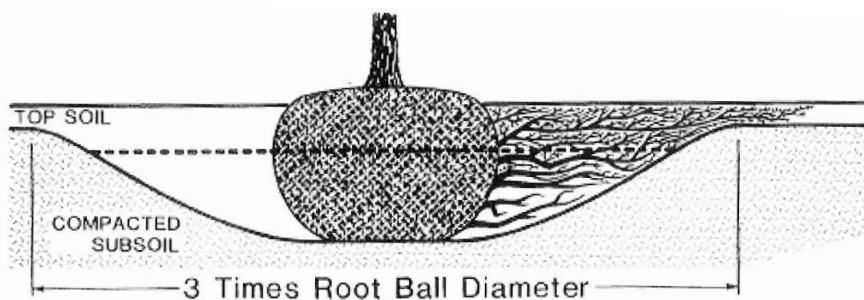


Figure 3.1: Schematic of root ball pit dimension for transplantation (GLTMSDB, 2014)

## 4. Post-transplantation Maintenance

### 4.1 Maintenance Duration

All the transplanted individuals shall be maintained by the ET for 12 months (establishment period) after planting into the receptor sites.

### 4.2 Watering

The receptor sites shall be thoroughly watered immediately after planting. During the establishment period, the soil shall be regularly monitored to prevent drying out. The individuals shall be watered properly and adequately or daily, if required, during the first three months after the transplantation especially during the dry season. After that, watering frequency shall be conducted at least twice a week until the end of the establishment period. Frequency of watering shall be adjusted accordingly so that the soil is kept moist but shall not be saturated.

### 4.3 Use of Mulch

Mulches help conserve moisture, maintain moderate soil temperature and control weeds around plants. Organic mulches such as thoroughly dried grass clippings or small wood chips shall be placed on the soil surface over the plant root system.

### 4.4 Pruning, Weeding and Fertilizer Application

Pruning will be conducted, if necessary, after transplantation to remove any broken or insect/fungal infested stems of the transplanted individuals. The receptor sites shall be kept free from weeds throughout the 12-month establishment period. Any unwanted weeds found in these areas shall be removed once identified and shall be carried out by hand as much as possible.

Post-planting fertilizer shall be applied, if necessary, not less than 100 days, and not more than 300 days, after grassing or planting. The fertilizer shall be applied at a rate of 50 g per shrub individual (Mott McDonald Hong Kong Ltd., 2010).

### 4.5 Above- and Belowground Support

Initial guying shall be implemented to help retain the transplanted individuals in an upright position until sufficient roots are developed to anchor them. Guys and straps (**Figure 4.1**) shall be removed, replaced or adjusted as necessary to ensure their effectiveness and to prevent constriction or abrasion damage to the tree during the establishment period of 12 months. However, these supports shall be removed after the establishment period as prolong use of these without proper adjustments will do more harm than good to the transplanted individuals (GLTMSDB, 2014).

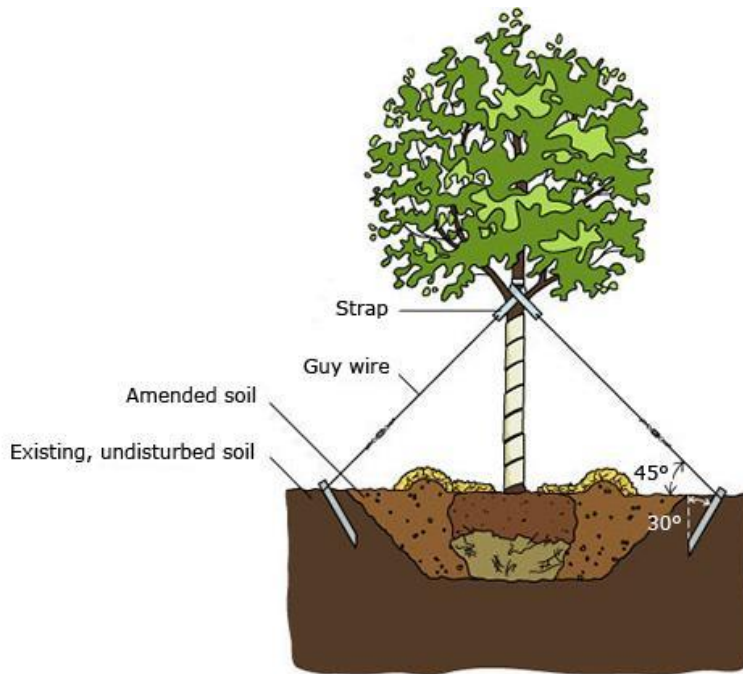


Figure 4.1: Schematic of above and belowground support (<https://m.espacepourlavie.ca/en/staking-tree>)

## 5. Audit of Transplantation Works

Post-transplantation audit shall include monitoring activities during the construction phase of the Project to ensure that an effective mitigation measure is provided to the transplanted individuals. The post-transplantation monitoring shall be conducted monthly for the first 12 months and then quarterly for a further of 12 months as required by **EP Condition 2.9, EIA Report Section 6.12.2.16** and **Section 5.5.2.14 of the EM&A Manual**.

### 5.1 Performance

Health conditions of the transplanted individuals shall be monitored at the receptor sites. A data sheet (**Table 5.1**) shall be used for recording the data and findings of the monitoring activities.

Table 5.1: Data Sheet for Post-Transplantation Audit Works

Details	Date:												
	Weather:												
	Individuals												
	B28	B29	B30	B31	B32	B33	B34	I12	I13	I14	I29	I31	
Species	<i>Camellia euryoides</i>						<i>Rhododendron farrerae</i>						
Growth condition													
Trunk													
Branches													
Foliage													
Root													
Any arboricultural problem/s													
Remedial measure/s													



Details	Date:											
	Weather:											
	Individuals											
	B28	B29	B30	B31	B32	B33	B34	I12	I13	I14	129	131
Injuries/damages												

## 5.2 Photographic Record

Photo-documentation of the transplanted individuals shall be done every monitoring period.

## 6. Compensatory Planting

All affected individuals are suitable for pre-construction transplantation, hence, no compensatory planting as suggested by **EM&A Manual Section 5.5.2.12** shall be conducted. However, should the survival rate of the transplanted individuals be found to be unacceptably low, the ET shall propose alternative compensation methods, such as seed collection or planting of new individuals of the same species after the works area has been reinstated. If required, a "Compensatory Planting Plan" shall be prepared by the ET and submitted to the Engineer, the Independent Environmental Checker (IEC), Environmental Protection Department and Agriculture, Fisheries and Conservation Department's for approval before implementing the recommendations of the plan. The "Compensatory Planting Plan" shall include details of the implementation programme and methodology for any proposed compensatory planting for species of conservation interest as required by **EIA Report Section 6.12.2.16** and **Section 5.5.2.14 of the EM&A Manual**.

## 7. Implementation Programme

### 7.1 Preparation and Deposit of Floral Transplantation Plan

As per **EP Condition 2.8** *The Permit Holder shall, at least one month before commencement of construction works, deposit with the Director three hard copies and one electronic copy of the "Floral Transplantation Plan"*.

### 7.2 Consent Request

Prior written consent for transplantation of floral species with conservation interest within the Lantau North Country Park will be obtained from the Country and Marine Parks Authority (CMPA) before commencement of transplantation works within the country park.

### 7.3 Floral Transplantation Works

Floral transplantation works will be undertaken during the pre-construction phase of the Project, one week before construction works commence as described in **EIA Report Section 6.12.2.15** and **EM&A Manual Section 5.5.2.13**.

## 7.4 Audit of Transplantation Works

Post-transplantation audit shall include monitoring activities during the construction phase of the Project to ensure that effective mitigation measures are provided to the transplanted individuals. Upon commencement of construction works, post-transplantation monitoring will be conducted monthly for the first 12 months and then quarterly for a further of 12 months as required by **EP Condition 2.9, EIA Report Section 6.12.2.16 and Section 5.5.2.14 of the EM&A Manual.**

## 7.5 Summary of Implementation Programme

The summary of implementation programme for the floral transplantation works and post-transplantation audit is shown in **Table 7.1.**

Table 7.1: Tentative Implementation Programme for Floral Transplantation Works and Post-Transplantation Audit

Activities	Pre-construction Phase											Construction Phase																								
	M1	M2	M3	M4				M5				M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	
				W1	W2	W3	W4	W1	W2	W3	W4*																									
Preparation and Deposit of Floral Transplantation Plan																																				
Floral Transplantation Works																																				
Audit of Transplantation Works																																				

Notes:  
M1= Month 1; W1= Week1  
\* Commencement of construction works

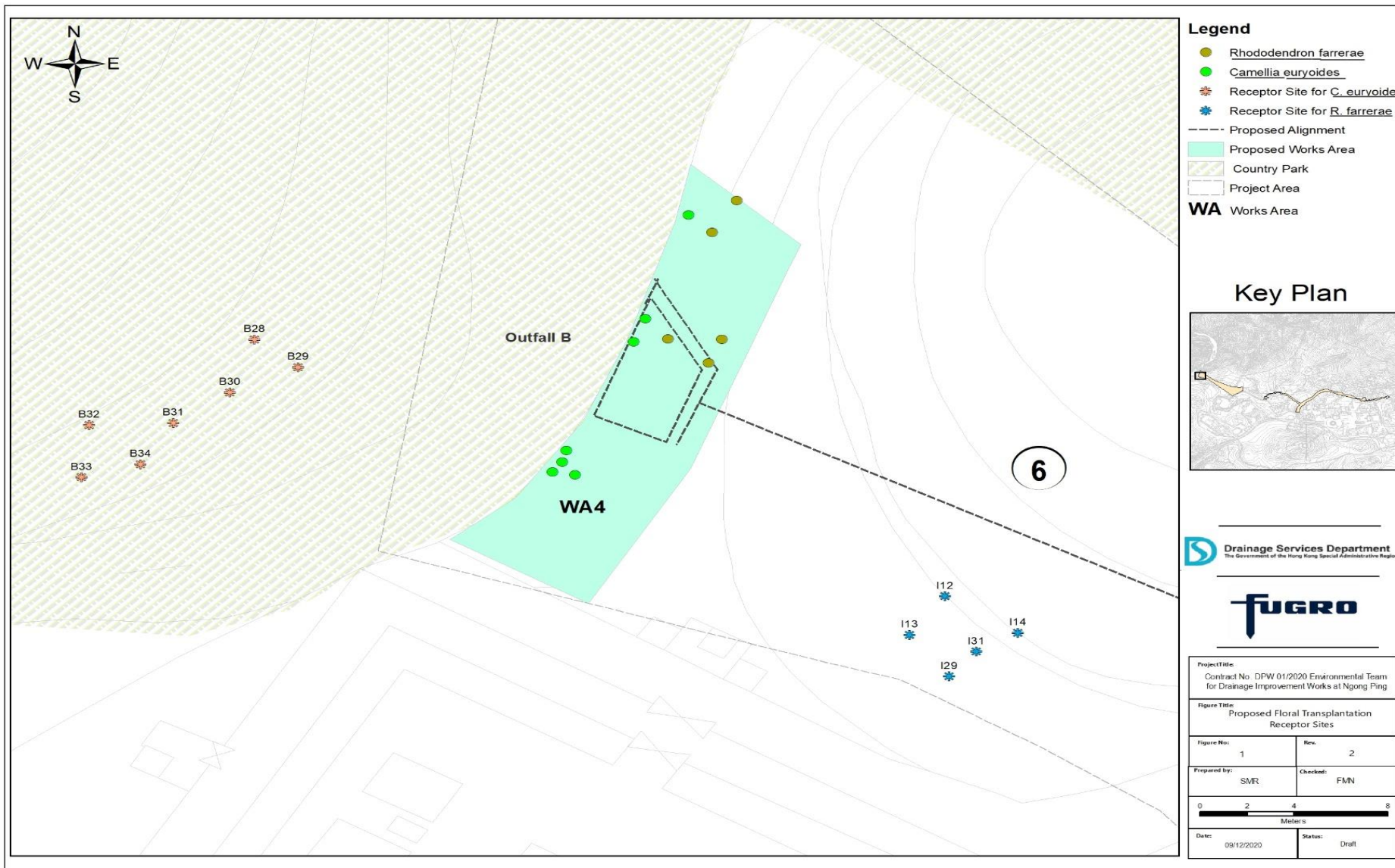
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# Appendix A

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Map of the existing locations  
and proposed receptor sites



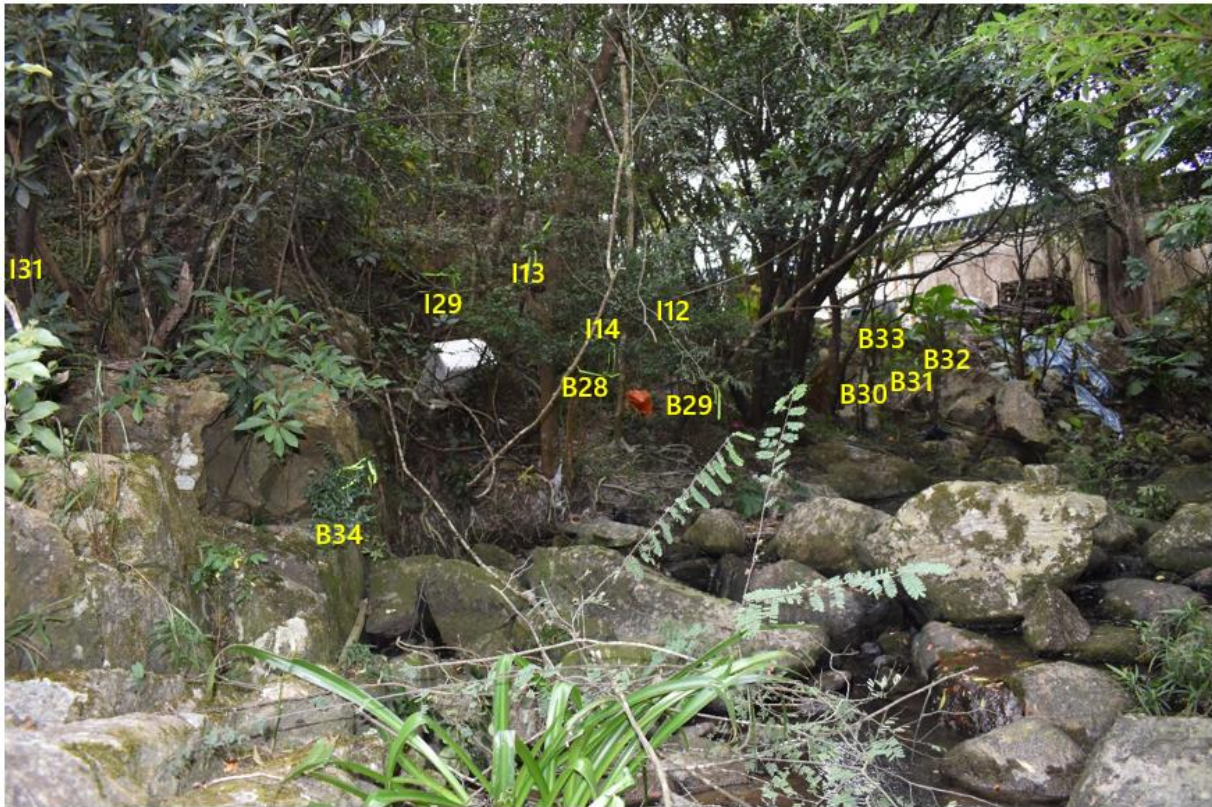
Appendix A.1: Map of the existing locations and proposed receptor sites for transplantation



# **Appendix B**

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Photos of plants at collection sites



Appendix B.1: Groups of *Camellia euryoides* individuals (B28 to B34) and *Rhododendron farrerae* individuals (I12 to I13; I29 and I31) at their existing locations



Appendix B.2: *Camellia euryoides* individuals B28 and B29 to be transplanted from their existing locations





Appendix B.3: *Camellia euryoides* individuals B30 to B32 to be transplanted from their existing locations

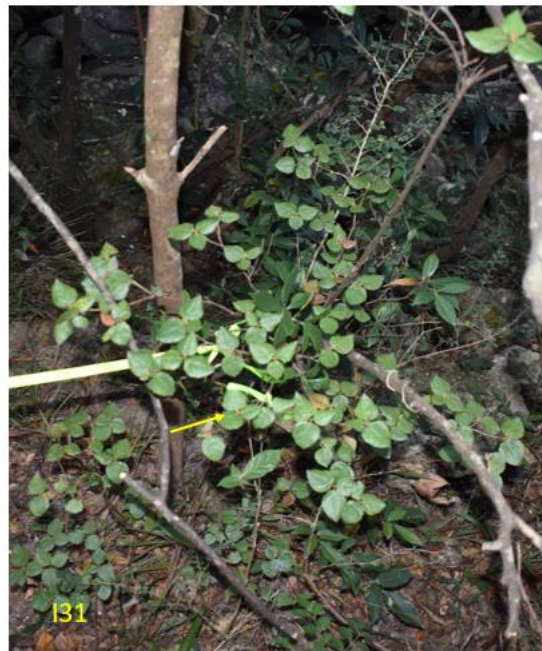


Appendix B.4: *Camellia euryoides* individuals B33 and B34 to be transplanted from their existing locations





Appendix B.5: *Rhododendron farrerae* individuals 112 to 114 to be transplanted from their existing locations



Appendix B.6: *Rhododendron farrerae* individuals 129 and 131 to be transplanted from their existing locations

# Appendix C

Photos of the receptor sites





Appendix C.1: Proposed receptor sites for *C. euryoides* individuals (B28 to B34)



Appendix C.2: Proposed receptor sites for *R. farrerae* individuals (I12 to I14; I29 and I31)