

Appendix 8 – Explanatory Notes for Form 2 – Individual Tree Risk Assessment

This Form 2 is provided with the *Guidelines for Tree Risk Assessment and Management Arrangement (TRAM Guidelines)* (10th Edition) and aligns with the latest tree risk assessment methods promulgated by the International Society of Arboriculture (ISA) and other overseas professional organisations. It intends to serve as a template for Inspection Officer to collect and record tree information and facilitate a meaningful individual tree basis risk assessment. For an advanced tree risk assessment, the Inspection Officer or arborist concerned shall submit a separate written report including but not be limited to the detailed assessment results on the risks of the tree or the tree part assessed. For further information on the requirements of the written report, the Inspection Officer may refer to the latest version of the ANSI A300 standards and the ISA Best Management Practice – Tree Risk Assessment or other relevant publications, such as BS 3998:2010 – *Tree Work - Recommendations* by the British Standards Institute.

Box(es) and space(s) are provided in the Form for collation of the right information. Please check the box(es) that reflect the observations. More than one box may be checked. Please also write comments and notes that are not covered elsewhere in the Form or for points that need additional explanation in the space(s) provided or under the “Other Observations” section. *It is not necessary to check every box or to fill in every space provided in this Form.* Only information relevant to the tree risk assessment should be collected.

Section 1 – General Information

This Section records the background information of the responsible department and the Inspection Officer who undertakes the individual tree risk assessment.

Department/Agency: name of the department or agency responsible for the tree risk assessment.

Inspection Officer: name of the Inspection Officer (automatic filled after login) who meets the academic, professional and training qualifications as well as work experience as specified in the ‘Requirements for Inspection Officers’ in the TRAM Guidelines. The qualifications of the Inspection Officer should be vetted by the responsible tree maintenance department and each department shall provide a list of accepted Inspection Officers to Greening, Landscape and Tree Management Section (GLTMS) of the Development Bureau for verification.

Post: post title of the Inspection Officer in the responsible department or agency.

Project/Contract No.: Project/Contract reference number in which the tree risk assessment is undertaken (if applicable).

File Ref.: file reference no. in the responsible department or agency that keeps the tree risk assessment reports, if applicable.

Date and Time of Inspection: date and time of the inspection in the format of dd/mm/yyyy and hr:min. If the inspection lasts for more than one day, the inspection date refers to the commencement date of the inspection.

Last Inspection Date: date of last inspection of the subject tree in the format of dd/mm/yyyy. If the inspection lasts for more than one day, the last inspection date refers to the commencement date of the last inspection. If it is the first-time inspection of the subject tree, please set it to the Date of Inspection.

Inspection Time Spent: the time spent in the field inspection of the subject tree to the nearest 0.5 hour. Travelling time should not be included.

Inspection Frequency: the frequency of inspection, for example, if the subject tree is inspected every six months, please mark '6 months' or if the subject tree is inspected every year, please mark '12 months', etc. Please mark '*ad hoc*' if the tree risk assessment is undertaken on a need basis.

Section 2 – Tree Information

This Section provides background information of the tree assessed.

TMCP ID: A system generated ID to give a unique reference number to the trees in the new tree database, Tree Management Common Platform (TMCP). Please be alerted that if Inspection Officer input more than one departmental tree ID to an individual tree, different TMCP Tree IDs will be generated, hence, Inspection Officer should be aware of using a unique Departmental Tree ID for an individual tree. If the tree was transferred to other department/third party, original department shall follow "**Tree Transfer**" procedures to update the Departmental Tree ID accordingly.

Departmental Tree ID: the departmental identification number of each tree inspected. Department shall decide a **unique Departmental Tree ID** for an individual tree and ensure all Inspection Officer followed.

Tree Species: the botanical name of the subject tree. Please also include the preferred Chinese common name (generally the first name listed is the preferred

common name) listed in the *Check List of Hong Kong Plants* (latest version) published by the Agriculture, Fisheries and Conservation Department (AFCD).

Triage Colour: the classification under the Triage System in the TRAM Guidelines. Please indicate the triage colour in the space provided. Please note that the triage classification may change in each assessment due to a change of the tree conditions and mitigation works completed. If the tree is one of the “Other Trees” in Zone I or one of the trees in other zones, no classification under the Triage System is necessary. Please mark ‘NIL’ in this situation.

Tree Height: estimated height of the subject tree from the existing ground level to the top of the tree crown measured to the nearest meter. For better estimation, please use a clinometer and/or range pole.

Crown Spread: diameter of the spread of the tree crown measured to the nearest meter. For asymmetric tree crown, the crown spread along the longest axis should be measured.

DBH of Tree Trunk: diameter of the tree trunk at breast height (1.3 meter above ground) measured to the nearest millimeter in accordance with AFCD’s Nature Conservation Practice Note No. 2 ‘*Measurement of Diameter at Breast Height (DBH)*’ (2006 or its latest version). For measurement of trees with multiple trunks, please input the individual trunk diameters in the boxes provided and then calculate the aggregate DBH in accordance with AFCD’s Practice Note No. 2. The tree risk assessment report should include photographic records showing the multiple trunks and each trunk numbered in sequence (i.e. #1, #2...etc.). If there are more than five individual trunks, please provide the individual trunk diameters in a separate sheet but the aggregate DBH should cover all individual trunks.

Tree Status: tree status in the Tree Register. Please indicate whether the subject tree is an Old and Valuable Tree (OVT), a Stonewall Tree (SWT), Large Tree (with an individual trunk(s) DBH \geq 500 mm or overall height at 9 metres or above), a Brown Root Rot (BRR) disease infected tree or other trees. If applicable, please fill in the OVT Register No. and Tree Register No. for OVT and SWT respectively in the space provided. Please check more than one box if applicable.

Section 3 – Location Information

This Section provides location information of the subject tree.

Masterzone Ref. & Subzone Ref.: Masterzone reference number and Subzone reference number in the Tree Management Common Platform (TMCP) for the subject tree. Please fill in “NIL” if there is no Subzone. Details for the zoning of Masterzones and Subzones are specified in the TMCP Manual which can be viewed and/or downloaded from the Cyber Manual for Greening (<http://devb.host.ccgo.hksarg>). The zones are determined by the responsible department.

Chinese Location and English Location: Chinese and English names of the tree location. Please refer to the location/street names in the latest version of the ‘*Hong Kong Guide*’ published by the Lands Department.

District: use district categorisation in 18 District Councils.

Tree Risk Management Zone Category: category of Tree Risk Management Zone as specified in the TRAM Guidelines. Please check the ‘Category I’ box if the tree falls into Category I zone; check the ‘Category II’ box if the tree falls into Category II zone; and check the ‘Category III’ box if the tree falls into Category III zone.

Co-ordinates: x- and y-coordinates of the tree at the centre of the tree trunk according to the HK1980 Grid Coordinates up to 3 decimal places. The coordinates can be measured by common GPS devices.

Location Type: venue or particular area that the subject tree is located. Please mark SIMAR Slope Number in the space provided if the subject tree is within a SIMAR slope. Please check “Others” if none of the venues or areas is applicable. For trees within a tree ring on a shotcrete slope, check “Tree Pit/Tree Ring”. Please check more than one box if more than one location type apply, for example, if the tree is growing in a tree pit in a housing estate, please check “Tree Pit” and “Housing Estates”, etc. Provide location information in space in ‘Others’ if the subject tree group does not fall into the boxes provided.

Nearby Utility Reference No.: nearby public utility reference number, such as lamp post number. Please mark the utility on the location map with its reference number clearly indicated.

Section 4 – Target Assessment

This Section provides information on the potential targets affected by the subject

tree. One individual tree or a tree part may affect one or more potential targets. The assessment of each potential target facilitates a better assessment of the likely consequence of a potential tree failure.

Target Number: the potential targets in priority according to the severity of consequence. People is always the most critical target with the most severe consequence.

Target Description: brief description of the target identified, for example, 'pedestrians', 'people in leisure/amenity area', 'occupied resident house', 'cars in carpark', 'school', 'play area', 'low-traffic street', or 'high-traffic street', etc.

Target Zone: location at which the target would likely be present the most. Please check the box if the target would likely be:

- Within dripline – the target is within the dripline of the subject tree; or
- Within 1.5 x Ht. – the target is outside the dripline but within the striking distance, i.e. 1.5 times of the total tree height.

Occupancy Rate: estimated amount of time in a day or a week that the target would likely be present within the Target Zone.

- Rare – the target is not commonly within the Target Zone.
- Occasional – the target is present within the Target Zone infrequently or irregularly.
- Frequent – the target uses or performs activity within the Target Zone for a large portion of a day or a week.
- Constant – the target is present within the Target Zone at nearly all times, 24 hours a day, 7 days a week.

Remove Target: remove the target as far as possible to eliminate the risk. Please check the box 'Yes' if the target can be removed; otherwise, please check the box 'No'.

Restrict Usage: restrict usage to eliminate the risk if possible. Please check the box "Yes" if access to the Target Zone can be restricted; otherwise, please check the box 'No'.

Section 5 – Site Conditions

This Section provides background information of the site that may affect the likelihood of tree failure.

Topography: topography of the site where the tree is growing. Please check the box "flat", "natural terrain", "man-made slope", "retaining wall" or "stonewall" where

applicable and specify other site observations in the box “Other”. For example, if the tree is a stonewall tree and cracks on the stonewall is observed, more information shall be provided in the “Other” box. Please check more than one box to fully describe the site setting.

Site Changes: site factors affecting the root system of the subject tree or site factors that may affect the wind exposure of the subject tree:

- None – no soil changes observed.
- Grade change – soil was added or removed from the site.
- Site clearing – adjacent tree(s) had been removed or significantly reduced, which may cause the assessed tree to become exposed to wind.
- Others – other necessary information or further description of site change.

Soil Conditions: factors that may affect the health and/or vitality of the tree assessed, or the ability of the assessed tree’s root system to provide sufficient mechanical support.

- Normal – normal soil conditions.
- Compacted – soil is severely compacted, limiting the depth, spread, and distribution of the root system.
- Water logging – water-logged due to poor drainage, high water table, excessive irrigation or assessed tree grows in a low area.
- Others – conditions that has not been covered in the boxes provided or further descriptions of soil conditions is considered necessary.

Soil Crack or Crack behind Lean: Please check the box if soil crack or crack behind lean was observed. Give more descriptions in the space provided when necessary. Root detection and mapping survey should be arranged when necessary to confirm if root system is damaged if resource permit.

Restriction within the Dripline: Please check the box and estimate the percentage restriction observed within the dripline of the tree assessed. Restriction refers to building, pavement, roads, hard landscape features, retaining wall, planter boundary or drainage channels etc. Root detection and mapping survey should be arranged when necessary to confirm if root development is restricted too.

Tree Failure Record: Please check the box if whole-tree failure(s) at the site of the tree assessed was reported in the past 12 months of the site inspection, saving for the trees that have failed during typhoons. Please give more

information including the estimated time of the tree failures and the reasons for the failures, etc., if possible. Particular attention shall be drawn if branch failure of the same tree was recorded in the past 6 months.

Brown Root Rot Disease Record: Please check the box if Brown Root Rot Disease (BRRD) infected tree(s) was previously identified within the dripline of the assessed tree (Distribution of BRRD infected tree location can be viewed on TMCP web layer). Please give detailed descriptions including the estimated time of disease identification, treatment applied, etc., if possible. Soil pathogen test, including BRRD, should be conducted if necessary.

Other Observations: Please provide other observations that have not been covered in this Section.

Section 6 - General conditions

This Section provides general conditions of the tree assessed.

Tree Vigor: the overall health conditions of the tree assessed. Please indicate:

- Low – tree growth is restricted or stunted, smaller than normal size, leaf density below average and/or abnormal epicormics. If tree vigor is Low, further checking on trunk internal decay or root system defects/damages occurred by resistograph, tomograph or soil pathogen test should be arranged when necessary.
- Normal – tree growth is in similar size of a typical/average sample tree for its species in the area, leaf conditions and branching show no significant defects. Root growth is in normal conditions, no restriction.
- High – tree is growing well and appears to be of a size above a typical/average sample tree for its species in the area. It is also free from any restriction, diseases or pests infestation.

Lean: angle of the trunk measured from vertical line. Please indicate:

- No – no leaning observed.
- Yes – measure the angle from vertical line and record in the space provided. If the tilt angle is larger than 15 degrees, tree stability shall be assessed.
- Recent Tilt – tilting was first identified in the current inspection or the leaning angle has continued, active leaning by more than five (5) degrees in the past 12 months, root system and trunk decay should be assessed. Root plate lifting, root breaking or soil cracks shall be carefully checked. Root detection and mapping survey should be arranged when necessary to confirm if the tree root grows healthy or restricted, if resource permit.

- Natural due to phototropism – leaning due to phototropism.
- Self-corrected – leaning of tree corrected due to self-correction mechanism.
- Response growth – reaction wood or additional wood has grown to increase the structural strength of the trunk/branches; describes location and extent of response growth observed.

Wind Exposure: factors that affect wind load of the tree assessed.

- Protected – other trees, structures or buildings in the area significantly reduce wind velocity or the exposure of the assessed tree to wind.
- Partial – other trees, structures or buildings near the tree moderately reduce the impact of wind on the assessed tree.
- Exposed – the assessed tree is fully exposed to wind, e.g. standalone tree, tree at the edge of a forest/plantation, etc. If the tree is identified exposed to wind direction, crown loading and imbalance crown shall be assessed and necessary crown reduction shall be considered to reduce crown loading.
- Wind funneling – wind may be ‘funneled’ or ‘tunneled’ (by buildings, canyons, large stands of trees) towards the assessed tree so that wind velocity experienced by the assessed tree is increased dramatically. If the tree is identified located at “Wind Funneling” site, crown loading and imbalance crown shall be assessed and necessary crown reduction shall be considered to reduce crown loading. More thorough crown inspection shall also be conducted to remove dead branches or hanging branch on the tree crown.

Wildlife or Nesting Site: wild birds or other wildlife including bats, squirrels, etc. may use the branches or cavity of the assessed tree for nesting. Please indicate:

- None – no nesting activity is observed.
- Yes – nesting activity is observed. Please record on-site observations in the space provided (if available), including the name of the wildlife (if known), quantity, and location of nests, etc.

Cable or Brace: presence of cable or brace installed to provide additional support to the assessed tree. Please indicate:

- None – no cable or brace system was installed.
- Yes – cable or brace system was installed. Please provide more information if possible, including the type of cables or braces, conditions of cables or braces, effectiveness, maintenance requirement, etc., in the space provided.

Pruning History: maintenance/pruning record of the assessed tree in the past 12 months or the latest tree assessment. Please indicate:

- Cleaned – crown cleaning was conducted.
- Thinned – crown thinning was conducted.
- Raised – crown raising was conducted.
- Reduced – crown reduction was conducted.
- Structural pruning – structural pruning was conducted, normally for young trees.
- Topped – inappropriate pruning technique used to reduce tree size; characterized by inter-nodal cuts.
- Lion-tailed – inappropriate pruning practice used to remove an excessive number of inner and/or lower lateral branches.
- Others: give detailed descriptions on the items checked, last pruning date and other pruning records not covered above.

Other Observations: Please provide other observations that have not been covered in this Section.

Section 7 – Crown Conditions

This Section provides information on the crown conditions of the assessed tree.

Crown Density: the branches, foliage and other reproductive parts of a tree forming the tree crown that blocked light visibility or penetration through the crown. Crown density can be estimated by using the crown density – foliage transparency card or electronic densitometers. Please indicate:

- Normal – crown density is similar to a typical/average sample tree for its species in the area.
- Sparse – crown density is lower than a typical/average sample tree for its species in the area that allows a large degree of wind and light penetration. Please estimate the percentage of crown density in <25%, 25% - <50%, or 50% - <75% by comparing to a typical/average sample tree for its species in the area and fill in the space provided. Over 75% is considered “Normal”. If crown density is lower than 50%, assessment on root development (by root detection and mapping survey) and trunk decay assessment by resistograph or tomograph should be arranged when necessary to check the reasons of the sparse crown

Imbalanced Crown: Please check the box if the canopy is not uniformly formed. Please counter check the tree stability if the heavy side of the tree crown falls to a busy traffic road, school, playground or gathering place. Crown reduction shall be conducted to reduce crown load and rectify the imbalance crown.

Live Crown Ratio (LCR): the ratio of the height of the live crown to the total height of entire tree [(crown height/tree height) × 100%]. Please check the appropriate box for the estimated range of LCR. If live Crown Ratio is lower than 40%, further assessment on trunk or root internal decay by resistograph or tomograph, or root system defects/damages by equipment for root detection and mapping, should be arranged when necessary to identify cause of low crown ratio. Pruning history shall also be counter-checked to identify if any unnecessary pruning was conducted.

Crown Load: the estimated overall loading at tree crown of the assessed tree. This may vary with the density of foliage and other reproductive parts, canopy architecture, etc.

- Normal – crown load is similar to a typical/average sample tree for its species in the area.
- Heavy – crown load is much higher than a typical/average sample tree for its species in the area. If heavy load of crown is identified, crown reduction shall be considered to reduce crown loading.
- Declined – crown load is lower than a typical/average sample tree for its species in the area. If crown load is identified “declined”, assessment on trunk internal decay by resistograph or tomograph, or thorough assessment on root development by equipment for root detection and mapping, should be arranged when necessary, or soil pathogen test as required. Although most of the nutrient deficiency symptoms can be observed by experienced inspection officers, soil nutrient content test should be considered to check if any nutrient deficiency in the planting soil, however, application of fertilizers shall be carefully planned as over fertilization will also damage the root system and the tree health. Departments shall also be aware of the restriction on the application of fertilizers at Water Gathering Ground and Country Parks.

Foliage: an important indicator of tree health based on the comparison with a healthy specimen of the same species in the area. Please indicate:

- Fallen leaf (seasonal) – fallen leaf observed on the tree, check if the tree is a deciduous tree and leaves shed in winter.
- Defoliation (withered) – defoliation observed on the tree, check if the tree is withered and leaves shed before it is dead. Check if internal trunk decay or root system damages caused the defoliation. Soil nutrient content test should be considered to check if any nutrient deficiency in the planting soil, however, application of fertilizers shall be carefully planned as over fertilization will also damage the root system and the tree health. Departments shall also be aware of the restriction on the application of fertilizers at Water Gathering Ground and Country Parks.
- Normal - foliage color is similar to a typical/average sample tree for its

species in the area.

- Chlorotic – leaves become yellowish-green to yellow, estimate the percentage of chlorotic foliage in the canopy and fill in the space provided. Check if the planting site is water-logged or insufficient of water. Soil nutrient content test shall be considered to check if any nutrient deficiency in the planting soil, however, application of fertilizers shall be carefully planned as over fertilization will also damage the root system and the tree health.
- Necrotic – dead leaves remained in the tree crown, estimate the percentage of necrotic in the tree crown and fill in the space provided. Check if the planting site is water-logged or insufficient of water. Check if internal trunk decay or root system damages caused the defoliation. Soil nutrient content test should be considered to check if any nutrient deficiency in the planting soil, however, application of fertilizers shall be carefully planned as over fertilization will also damage the root system and the tree health. Departments shall also be aware of the restriction on the application of fertilizers at Water Gathering Ground and CountryParks.

Leaf Size: size of leaves in the mature part of the assessed tree.

- Normal – leaf size in mature part of the assessed tree is similar to a typical/average sample tree for its species in the area.
- Smaller than normal – leaf size in mature part of the tree is smaller than leaves in a sample species in the area. Soil nutrient content test should be considered to check if any nutrient deficiency in the planting soil, however, application of fertilizers shall be carefully planned as over fertilization will also damage the root system and the tree health. Departments shall also be aware of the restriction on the application of fertilizers at Water Gathering Ground and CountryParks.

Dieback Twigs: progressive death of twigs starting at the tips of shoots or branches. The percentage of dieback twigs can be estimated by comparing the portion of dieback twigs to the entire tree crown. Please indicate:

- <5% – less than 5% of dieback twigs was observed.
- 5% – <25% - dieback appeared on about 5% to less than 25 % of canopy
- 25% – 50% - dieback appeared about 25% to 50% of the canopy
- >50% – dieback extended to over 50% of the canopy.

If the dieback twigs is more than 25%, assessment on trunk internal decay by resistograph or tomograph, or thorough assessment on root development by equipment for root detection and mapping should be arranged when necessary, or soil pathogen test as required.

Epicormics: Please check the box if epicormics, which are shoots sprouting vigorously from damaged bark/wounds on trunk or branch of a tree, are present.

Extensive growth of epicormics always indicates poor health conditions or wound damages, thorough check of tree health conditions, in particular internal decay at old wounds or cavity, shall be conducted.

Hanger(s): Please check the box if hanger(s), which is a broken part of trunk or branch that remains or hangs up in the tree crown. This hanger may impose high potential risk to the target(s), especially unprotected target(s), present underneath the canopy of the tree. Removal of hanger should be conducted as soon as practicable.

Pest and Disease: Please check the box if pest(s) or disease(s) was observed on the assessed tree. Please try to identify the pest(s) or disease(s) detected on the assessed tree such as Brown Root Rot Disease and decay caused by *Ganoderma* spp. and termites (use termite detector if necessary), for better pest/disease control. If the pests/fungi cannot be identified on site, please collect samples to the TMO for further identification. For *Phaouda flammans* infestation, TMO has collected departments' information and created a distribution layer on TMCP map for departments to view.

Other Observations: Please provide other observations that have not been covered in this Section.

Section 8 – Branch Conditions

This Section provides information on the branch conditions of the assessed tree. Please check the appropriate box(es) if the following branch conditions are observed:

Co-dominant Branches: branches of nearly equal diameter arising from a common junction, from apical buds at the tip of the same stem and lacking normal branch union or collar. Co-dominant branches in combination with other defects, such as acute angle attachment, included bark and high aspect ratio, may increase potential of branch failure. Thorough inspection shall be conducted to identify if any other structural defects had been associated with the co-dominant branches. The inspection can be conducted by aerial inspection (tree climbing), binocular or Drone inspection as required.

Included Bark: bark that embedded in a union of two or more branches or between branch and trunk, resulting a weakened structure or source of decay to core wood. Included bark in combination with other defects, such as low live crown ratio, and/or high aspect ratio, may increase risk of branch failure, mitigation measures including pruning of defective branch shall be conducted as far as practicable.

Cross Branches: crossing, rubbing or upright branches that may cause damage to tree bark or resulted in weakened structure. Cross-branching contributes weak point to branch failure, mitigation measures shall be conducted timely to prune the defective branch as far as practicable.

Crooks or Abrupt Bends: abnormal bending of tree branch. The crooks or bends may result in weak point on branch(es), mitigation measures shall be conducted timely to prune the defective branch as far as practicable.

Sap Flow: oozing of liquid that may result from infections or infestations under the bark. The presence of sap flow may or may not be a structural defect or stability weakness. Internal decay assessment shall be considered to check the health and structural conditions of the branch as required.

Cracks or Splits: separation in the wood in either a longitudinal (radial, in the plane of ray cells) or transverse (across the stem) direction. If the conditions of cracks or splits is significant and may affect the structural safety of the branch, mitigation measures including removal of the defective branch shall be arranged as far as practicable.

Decay or Cavity: decay and cavity in a branch may be caused by mechanical injury or fungal damage or wildlife nesting, resulting in weakened structure on the branch. Internal decay assessment shall be conducted to assess the sound wood percentage and the extent of decay. Necessary mitigation measures shall be conducted to remove the defective branch as far as practicable. As tree has self-defense mechanism, no particular treatment, including applying protective reagents/resin or covering the opening of the wound/cavity is required.

Heavy Lateral Limb: leaves clustered at tip of a long branch. Heavy lateral limb (Lion Tail) may contribute high branch failure rate, removal of the Lion-tailed branch or mitigation measures to enhance lateral growth of the Lion-tailed branch shall be considered. Counter check the pruning history is required to identify mal-practice of pruning.

Dead Wood: dead wood may be resulted from poor pruning or remains of hangers. Mitigation measures shall be arranged to remove the dead wood as soon as practicable.

Cankers or Galls or Burls: cankers are localised diseased areas (lesions) on the trunk, branch or even roots; often sunken or discolored; galls are abnormal swellings of tissue caused by pests; may or may not be a defect; burls are outgrowth on the branch; not usually considered a defect. Resistograph or

tomograph should be arranged when necessary to identify if any internal decay was caused and the percentage of sound wood remained as far as practicable.

Wound or Mechanical Injury: wound or mechanical injury observed on branch. Wound is an opening that is created when the bark of a live branch is cut, penetrated, damaged, or removed. Please provide more descriptions if necessary. Internal decay assessment shall be conducted to assess the sound wood percentage and the extent of decay if resources permit. Necessary mitigation measures shall be conducted to remove the defective branch as soon as practicable. As tree has self-defense mechanism, no particular treatment, including applying protective reagents/resin or covering the opening of the wound/cavity is required.

Pest and Disease: Please check the box if pest(s) or disease(s) was observed on the assessed tree. Please try to identify the pest(s) or disease(s) detected on the assessed tree such as Brown Root Rot Disease and decay caused by *Ganoderma* spp. and termites (use termite detector if necessary), for better pest/disease control. If the pests/fungi cannot be identified on site, please collect samples the TMO for further identification. Mitigation measures including application of pesticides or fungicides should be considered as appropriate. If application of fungicides is required, prior advice from a qualified pathologist or specialist shall be sought.

Parasitic or Epiphytic Plants: parasitic or epiphytic plants grow on branches. The presence of parasitic or epiphytic plants may or may not affect health or structure of the tree. Please try to identify the parasitic or epiphytic plants observed and provide details in the space provided. Mitigation measures to remove the parasitic or epiphytic plants shall be arranged as appropriate. For removal of *Mikania*, technical notes issued by the AFCD on removal of *Mikania* shall be observed.

Fungal Fruiting Bodies: fungal fruiting bodies or mycelia present at decayed part of the assessed tree. Please try to identify the common wood decay fungi such as Brown Root Rot Disease and decay caused by *Ganoderma* spp. as far as possible. Close-up photographs showing the key features of the fungi should be included to aid subsequent identification. Soil pathogen test should be arranged when necessary to identify possible species of pathogenic fungi and appropriate mitigation measures including application of fungicides should be considered when necessary. If application of fungicides is required, prior advice from a qualified pathologist or specialist shall be sought.

Response Growth: reaction wood or additional wood that has grown to increase the structural strength of the branch. Please indicate the location(s) and extent.

Other Observation: Please provide other observations that have not been covered in this Section.

Section 9 – Trunk Conditions

This Section provides information on the trunk conditions of the assessed tree.

Cavity: Please measure and input the dimensions of cavity on tree trunk. The direction of cavity opening and height of cavity (measured at the center of the opening above ground level) should be measured and marked in the space provided. Internal decay assessment shall be conducted to assess the sound wood percentage and the extent of decay. Necessary mitigations measures shall be conducted to remove the defective trunk or the whole tree as soon as practicable. As tree has self-defense mechanism, no particular treatment, including applying protective reagents/resin or covering the opening of the wound/cavity is required.

Please check the appropriate box(es) if the following trunk conditions are observed:

Co-dominant Stems: trunks of nearly equal diameter arising from a common junction and lacking a normal union or collar. Co-dominant stems in combination with other defects, such as acute angle attachment, included bark and high aspect ratio, may increase potential of failure. Thorough inspection shall be conducted to identify if any other structural defects had been associated with the co-dominant stems. The inspection can be conducted by aerial inspection (tree climbing), binocular or Drone inspection as required. If the situation threatened the safety of the tree, removal of the defective stem or the whole tree shall be considered as soon as practicable.

Included Bark: bark that embedded in a union of two or more trunks, causing a weakened structure at the trunk. Included bark in combination with other defects, such as low live crown ratio, and/or high aspect ratio, may increase the likelihood of failure. If the situation threatened the safety of the tree, removal of the defective stem or the whole tree shall be considered as soon as practicable.

Poor Taper: the decrease in diameter over the height of tree trunk. New exposure of poor taper tree may result in higher possibility of failure. Structural stability of the tree with poor taper shall be further assessed. If the tree failure risk rating is “High” or “Extreme”, tree removal shall be considered as soon as practicable.

Crooks or Abrupt Bends: abnormal bending of tree trunk(s), new exposure of

trees with crooks or bends may result in weak point on the trunk(s) and is a significant contributor to likelihood of failure. Mitigation measures shall be conducted timely to remove the defective stem or removal the whole tree as far as practicable.

Cracks or Splits: separation in the wood in either a longitudinal (radial, in the plane of ray cells) or transverse (across the stem) direction. If the conditions of cracks or splits is significant and may affect the structural safety of the tree, mitigation measures including removal of the defective stem shall be arranged as far as practicable.

Abnormal Bark Crack: bark cracks may be a common character on tree trunk. It would be useful to compare with other trees of the same species in the area to identify abnormal bark cracks. New exposure of abnormal bark crack may contribute to higher likelihood of failure. Mitigation measures including removal of the defective stem or removal of the whole tree shall be considered.

Sap Flow: oozing of liquid that may result from infections or infestations under the bark. The presence of sap flow may or may not be a structural defect or stability weakness. Resistograph or tomograph should be arranged when necessary to identify if any internal decay was caused and the percentage of sound wood remained if resource permit. If the situation threatened the safety of the tree, removal of the defective part or the whole tree shall be considered as soon as practicable.

Cankers or Galls or Burls: cankers are localised diseased areas (lesion) on the trunk, branch or even roots; often sunken or discolored; Galls are abnormal swellings of tissue caused by pests; may or may not be a defect; Burls are outgrowth on the trunks; not usually considered a defect. Resistograph or tomograph should be arranged when necessary to identify if any internal decay was caused and the percentage of sound wood remained if resource permit.

Wounds or Mechanical Injury: wound or mechanical injury observed on tree trunk. Please give more descriptions if necessary. Internal decay assessment shall be conducted to assess the sound wood percentage and the extent of decay. Necessary mitigation measures shall be conducted to remove the defective part or the whole tree as far as practicable. As tree has self-defense mechanism, no particular treatment, including applying protective reagents/resin or covering the opening of the wound/cavity is required.

Pest and Disease: pest and disease that may significantly affect tree health or stability. Please try to identify the pest or disease detected on the assessed tree, such as termites (use termite detector if necessary), for better pest/disease

control. If the pests/fungi cannot be identified on site, please collect samples to the TMO for further identification. Mitigation measures including application of pesticides or fungicides should be considered as required. If application of fungicides is required, prior advice from a qualified pathologist or specialist shall be sought.

Parasitic or Epiphytic Plants: parasitic or epiphytic plants grow on tree trunk(s). The presence of parasitic or epiphytic plants may or may not affect health or structure of the tree. Please try to identify the parasitic or epiphytic plants observed on the tree and fill in the space provided. Mitigation measures to remove the parasitic or epiphytic plants shall be arranged as appropriate. For removal of Mikania, technical notes issued by the AFCD on removal of Mikania shall be observed.

Fungal Fruiting Bodies: fungal fruiting bodies or mycelia present at decayed parts of the tree. Please try to identify common wood decay fungi, such as Brown Root Rot Disease and decay caused by *Ganoderma* spp., as far as possible. Close-up photographs showing the key features of the fungi should be included to aid subsequent identification. Soil pathogen test should be arranged when necessary to identify possible species of pathogenic fungi and appropriate mitigation measure including application of fungicides shall be arranged. If application of fungicides shall be undertaken, prior advice from a qualified pathologist or specialist shall be sought.

Response Growth: reaction wood or additional wood that has grown to increase the structural strength of the trunk. Please note location(s) and extent.

Other Observation: Please provide other observations that have not been covered in this Section.

Section 10 – Root Conditions

This Section provides information on the root conditions of the tree assessed. Please check the appropriate box(es) if the following root conditions are observed:

Root Collar not Visible: if possible, please determine and note the depth of root collar below ground. Mitigation measures including the removal of top soil to expose the root collar, application mulching to improve soil conditions should be considered

Cracks or Splits: separation in the wood in either a longitudinal (radial, in the plane of ray cells) or transverse (across the root) direction. Mitigation measures including removal of the defective roots is required as soon as practicable.

Root detection and mapping should be arranged when necessary to counter-check the health root distributions if resource permit.

Exposed Root: roots exposed, curling or snaking around a tree. Root exposure may be caused by erosion of top-soil, lack of soil space for root growth or over trampling. Mitigation measures including application of mulching and replacement of top soil should be considered. If the exposed root has damaged the pavement nearby, elevated walkway or other site improvement work shall be considered.

Root Rot: root rot is a common root disease. Please try to identify the type of root rot and provide close-up photographs of the rotted areas for further identification. Mitigation measures including application of fungicides, removal of defective roots or removal of the whole tree should be considered as appropriate. If application of fungicides is required, prior advice from a qualified pathologist or specialist shall be sought.

Cut or Pruned Roots: roots cut or pruned may truncate the transmission path of water and nutrients to the trunk and leaves. Root detection and mapping survey should be arranged when necessary to counter check the distributions of healthy roots. Mitigation measures including application of mulching to reduce compaction should be considered to improve the soil conditions to promote new root development. If the root damages is assessed threatening to the stability of the whole tree, tree removal shall be considered.

Trunk Girdling: roots girdled the tree trunk may cause restriction to trunk growth. Resistograph or tomograph should be arranged when necessary to assess if internal decay and percentage of sound wood remained if resource permit. If the situation has threatened the safety of the whole tree, tree removal shall be considered.

Girdling Root: roots circles the tree base or below surface soil. The root girdling restricted or destructed the development of both trunk and roots, and may cause tree failure in extreme case. Root detection and mapping survey should be arranged when necessary to check the distributions of healthy roots if resource permit. If the root damages is assessed causing defective to the whole tree, tree removal shall be considered.

Dead Surface Roots: dead surface roots may indicate structural instability, check this box if dead surface root is observed. Root detection and mapping survey should be arranged when necessary to counter check the distributions of healthy roots if resource permit. Mitigation measures including application of mulching to improve soil conditions should be considered. If the root damage is

assessed causing defective to the whole tree, tree removal shall be considered.

Root-plate Movement: root plate may be affected by strong gust wind or soil erosion; root- plate movement may severely affect the stability of the tree. Mitigation measures including installing staking should be considered to maintain the stability for small trees. If root damage is serious or the tree is unstable after staking, tree removal shall be considered.

Wounds or Mechanical Injury: wounds or mechanical injury observed on the roots, in particular the exposed roots. As tree has self-defense mechanism, no particular treatment, including applying protective reagents/resin or covering the opening of the wound is required. If the root damages is assessed causing defective to the whole tree, tree removal shall be considered.

Pest and Disease: pest and disease that may significantly affect tree health or stability. Please try to identify the pest or disease detected on the assessed tree, such as termites (use termite detector if necessary), for better pest/disease control. If the pests/fungi cannot be identified on site, please collect samples to the TMO for further identification. Mitigation measures including application of pesticides or fungicides should be considered as required. If application of fungicides is required, prior advice from a qualified pathologist or specialist shall be sought.

Parasitic or Epiphytic Plants: parasitic or epiphytic plants grow on roots exposed. The presence of parasitic or epiphytic plants may or may not affect health or structure of the tree. Please try to identify the parasitic or epiphytic plants observed on the tree and provide details in the space provided. Mitigation measures to removal the parasitic or epiphytic plants shall be arranged as appropriate.

Fungal Fruiting Bodies: fungal fruiting bodies or mycelia present at decayed parts of the roots. Please try to identify common wood decay fungi, such as Brown Root Rot Disease and decay caused by *Ganoderma* spp., as far as possible. Close-up photographs showing the key features of the fungi should be included to aid subsequent identification. Soil pathogen test should be arranged when necessary to identify possible species of pathogenic fungi and appropriate mitigation measures including application of fungicides should be arranged when necessary. If application of fungicides is required, prior advice from a qualified pathologist or specialist shall be sought.

Response Growth: reaction wood or additional wood that has grown to increase the structural strength of the roots or root collar. Please note location(s) and extent.

Other Observations: Please provide other observations that have not been covered in this Section.

Section 11 – Risk Categorisation

This Section on risk categorisation follows the tree risk assessment method promulgated by the ISA, and the method is described in the “*Best Management Practice – Tree Risk Assessment*” (2011) published by the ISA.

Target Number: reference number of the targets in priority according to the severity of consequence as given in Section 4 – Target Assessment. **Please list a maximum of three most important targets on each tree part identified.**

Tree Part: the concerned part of the tree. It could be the whole tree, one or more branch(es), main trunk, or root, which might lead to damages of the target(s). A category of tree part may lead to one or more ‘Condition(s) of Concern’.

Condition(s) of Concern: the condition(s) of tree or tree part that affect the likelihood of failure and may lead to damages to target, e.g. ‘large, dead branch over a car parking space.’, ‘root plate movement observed at a tree near a residential house’, ‘trunk decay identified at a tree nearly a children playground’ etc.

Part Size: the size of the tree or tree part concerned. Please estimate the diameter of the tree part concerned; if whole tree is concerned, measure the DBH of the tree trunk.

Fall Distance: the fall distance of the tree part or the whole tree against the target concerned. The longer the fall distance, the larger the extent of damage.

Likelihood of Failure and Impact

According to ISA’s risk categorisation, ‘likelihood of failure and impact’ can be selected from a Likelihood Matrix – Likelihood of Failure x Likelihood of Impact, using the Likelihood Matrix table (Matrix 1).

The likelihood of failure can be categorized using the following guidelines:

- **Improbable** – failure of the tree or tree part concerned is not likely under normal weather conditions and may not fail under extreme weather conditions including red/black rainstorm, typhoon signal No. 8, or extreme winter monsoon, within a specified timeframe. According to the ISA guidelines, the ‘specified timeframe’ for estimating likelihood of

tree failure is between one to five years.

- Possible – failure of the tree or tree part concerned could occur under extreme weather conditions within a specified timeframe but would unlikely fail during normal weather conditions.
- Probable – failure of the tree or tree part concerned is expected under normal weather conditions within the specified timeframe.
Highly probable – the tree or tree part concerned has started falling or failure is most likely to occur in the near future under normal weather condition. If this situation is encountered, the Inspection Officer is required to take immediate action(s) to protect public safety.

If the species of tree falls with the “List of 20 Common Tree Species Requiring Special Attention” as reported by the TMO before commencement of TRAM Cycle every year, the rating of “Likelihood of Failure” should be duly considered to be rated at “Probable” or “Highly Probable” depends on the severity of the defects. Furthermore, tree defects including hanging branch, severe branch/trunk/root decay, and other major defects and health problems as stated in paragraph 2.4.4 in the TRAM Guidelines were observed, the “Likelihood of Failure” should also be rated at “Probable” or “Highly Probable” depends on the severity of the defects.

Regarding the likelihood of impacting target, it can be categorised in four levels:

- Very low - the chance of a tree or tree part failure impacting the target concerned is very low, for example, a rarely used site, an occasionally used site that is partially protected by shelter/cover/structure, or a rarely used trail, etc.
- Low - it is not likely that a tree or tree part failure will impact the target concerned, for example, an occasionally used site that is fully exposed to the tree concerned, a frequently used site that is partially exposed to the tree concerned, or a constant target that is well protected from the tree concerned.
- Medium - a tree or tree part failed may or may not impact the target, with nearly equal likelihood, for example, a frequently used site that is fully exposed to the tree concerned, a constantly used site that is partially protected from the tree concerned.

- High - A tree or tree part failure will most likely impact the target, for example, a fixed target is fully exposed to the tree concerned, high-use road or walkway adjacent to the tree concerned.

Risk Rating

According to ISA's risk categorisation, the risk rating of a specific tree part to a specified target can be selected from the Risk Rating Matrix – Likelihood of Failure and Impact x Consequence of Failure, by using the Risk Rating Matrix table (Matrix 2).

The consequence of failure can be categorised using the following guidelines:

- Negligible – no personal injury, low value property damage, or minor or no disruption to traffic or human activities will be involved. For example, the tree is located at remote location that almost no human activity or vehicular traffic, the failure of tree very unlikely to cause any human injury or property damages.
- Minor – very minor personal injury may or may not require simple first aid treatment, low to moderate property damage, or small disruptions to traffic or human activities will be involved. For example, the tree or tree part in question is relative small in size or the fall distance is low and the failure of the tree part of the whole tree is less chance to cause serious human injury or big damages to property or disruption to traffic.
- Significant – personal injury may result in hospitalization, moderate to high property damage, or considerable disruption to traffic or human activities will be involved. For example, the tree or tree part is relative large in size or the fall distance is medium, the tree failure may cause minor injury to human or minor damages to property or disrupted certain traffic circulation but would not close total blockage of traffic.
- Severe – serious personal injury or death, high value property damage, or major disruption to traffic and/or important human activities will be involved. For example, the tree or tree part involved is large in size or the fall distance is high, the failure of the tree may cause serious human injury or death, major damages to property or cause total blockage of traffic.

The Risk Rating, after using the Risk Rating Matrix table (Matrix 2), is further categorized into four categories:

- Low - the consequence of failure is “Negligible” or the likelihood of failure and impact is “Unlikely” or the likelihood of failure and impact is “Somewhat Likely” when the consequence of failure is “Minor”, the risk rating is “Low”. Routine mitigation measures or “No Further Action” shall

be applied to maintain the health and structural conditions of the tree assessed.

- Moderate - the consequence of failure is “Minor” when the likelihood of failure and impact is “Likely” or “Very Likely” or the likelihood of failure and impact is “Somewhat Likely” when the consequence of failure is “Significant” or “Severe”, the risk rating is “Moderate”. Routine mitigation measures shall be applied to maintain the health and structural conditions of the tree assessed.
- High - the consequence of failure is “Significant” when the likelihood of failure and impact is “Likely” or “Very Likely” or the likelihood of failure and impact is “Likely” when the consequence of failure is “Severe”, the risk rating is “High”. Mitigation measures shall be applied to alleviate the risk rating of particular target and tree part involved to lower the residual rating to “Moderate” or lower. If the proposed mitigation measure cannot achieve the lowering of risk rating, revised the mitigation measure shall be considered.
- Extreme - the consequence of failure is “Severe” when the likelihood of failure and impact is “Very Likely”, the risk rating is “Extreme”. Timely mitigation measures shall be applied to alleviate the risk rating of particular target and tree part involved to lower the residual rating to “Moderate” or lower as soon as practicable. If the proposed mitigation measures cannot achieve the lowering of risk rating, revised mitigation measure or remove the whole tree shall be considered. Measures to cordon-off the tree location and notice shall be posted around the tree assessed to avoid people passing-by or staying near the tree.

Section 12 – Mitigation Measures

This Section requires the Inspection Officer to make recommendations on mitigation measures based on the results of the tree risk assessment. Mitigation measures should be prioritised according to their urgency in terms of protecting public safety. The residual risk of the tree or individual tree part upon completion of the recommended mitigation measures should be estimated at the time of the inspection to evaluate if the recommended mitigation measures are implemented adequately.

Target No.: reference number of the targets in priority according to the severity of consequence given in Section 4 – Target Assessment.

Tree Part: the target tree or tree part that requires mitigation measures.

Mitigation Measures: the recommended mitigation measures to reduce the tree risk. For each target identified, appropriate mitigation measures shall be applied timely. Inspection Officer shall advise the completion date of the mitigation works after consulting department and tree works agent.

Anticipated Completion Date: the expected completion date of the recommended mitigation measures in the format of dd/mm/yyyy.

Residual Risk: estimated risk level upon completion of the recommended mitigation measures. For trees assessed in “High” or “Extreme” risk rating, appropriate mitigation measure shall be recommended to lower the risk rating to “Moderate” or lower. If the proposed mitigation measures cannot achieve the lowering of risk rating, revised mitigation measure or remove the whole tree shall be considered.

Section 13 – Notes, Explanations, Descriptions and Supplementary Information

Notes, Explanations, Descriptions and Supplementary Information: Please include any conditions or factors or observations that have not been well described elsewhere in the form, including additional notes of the Inspection Officer that are used as the basis for making decisions on the hazard, impact and risk levels in the riskassessment.

Overall Tree Risk Rating: the highest risk rating determined among the different problematic tree parts identified.

Overall Residual Risk: the highest residual risk upon completion of the mitigation measures for all the problematic tree parts identified. For trees assessed “High” or “Extreme” on “Overall Tree Risk Rating”, appropriate mitigation measures shall be recommended to lower the “Overall Residual Risk” rating to “Moderate” or lower. If the proposed mitigation measures cannot achieve the lowering of risk rating, revised mitigation measures or remove the whole tree shall be considered.

Advanced Assessment: The Inspection Officer needs to advise if advanced assessments for the tree concerned is required. Please check the box ‘Yes’ if required and provide detail of the advanced assessments recommended, including but not be limited to:

- Drill resistance(resistograph);
- Sonic tomography;

- Aerial inspection by tree climbing or Drone;
- Equipment for root detection and mapping; or
- Slope/stonewall stability analysis, etc.

Inspection Limitations: the possible limitations of the tree risk assessment. Additional information may be provided in the space 'Others'.

Attached Information: Please provide photos, map, measurements, drawings, figures, etc. relevant to the assessment.

Add Site Plan: relevant site plan should be uploaded. The site plan should show the location of the tree and targets concerned, the dripline, Target Zone boundary and relevant land status information.

Add Tree Photo: relevant photos including but not be limited to site photos, whole tree photos in different directions, close-up photos showing the defects with illustrations and denotes should be uploaded. All photos provided shall follows the photograph requirements set out in Appendix 6 – Photo-taking Guidelines for Tree Risk Assessment specified in the TRAM Guidelines. All photographs should be stamped with date and time at which the photo is taken.

Add Other Information: other relevant information that would help describe, illustrate and/or explain the tree risk assessment, mitigation measures and others should be included

References:

Agriculture, Fisheries and Conservation Department, 2006, Nature Conservation Practice Note No. 2 - Measurement of Diameter at Breast Height (DBH), Agriculture, Fisheries and Conservation Department, Government of Hong Kong Special Administrative Region, China.

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Dunster, J. A., Smiley, E. T., Matheny, N. and Lilly, 2017, Tree Risk Assessment Manual, International Society of Arboriculture, USA.

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Lonsdale, D., 2017, Principles of Tree Hazard Assessment and Management (7th ed.), Arboriculture Association, UK.

Shigo, A.L. 2008, A New Tree Biology and Dictionary (11th ed.), Shigo and Trees, Associated., USA.

Smiley, E. T., Matheny, N. and Lilly, S., 2017, “Best Management Practice: Tree Risk Assessment” (Second Edition), International Society of Arboriculture, USA.