APPENDIX G – LANDSCAPING SPECIFICATION

1.0 General

Design drawings

The Contractor shall produce for all areas to be landscaped, landscape design drawings prepared by a professional landscape architect, showing at least planting bed layout, species mixes, plant numbers, play equipment and sidewalk layout for submission to the Employer. The design shall be visually interesting and attractive and aim to enhance the environment

Sight lines

Only vegetation Types A (grass cover) or F (low vegetation) shall be planted within sight lines along the road.

Utilities

Only vegetation Types A and F shall be planted within 2 yards (6ft) of any utilities. Under no circumstances shall trees or large shrubs be planted over utilities.

Footpaths

The specification for footpaths is that given in the Specification.

Recreation Areas

Each area shall be designed to be visually attractive and appropriate for the location.

Roundabouts

Roundabouts shall be planted with the vegetation described. The design of the layout and species mixes of the roundabout shall be visually interesting and attractive. Each roundabout shall contain:

- 30% of the total area Type F vegetation
- 70% of the total area Type A vegetation
- Average of 10 trees/palms chosen form the list given in vegetation Type K

Protective Fencing

The fencing shall be at least 6 feet in height and constructed from galvanised steel posts and wire mesh in accordance with FDOT Roadway and Traffic Design Standards. The design of the fencing shall be sufficient to prevent entry by persons from the roadside in particular to prevent illegal dumping.

Existing vegetation outside the right of way

The Contractor shall ensure that the existing vegetation outside the right of way remains undamaged by the Works. Specifically the Contractor shall not:

- Stockpile material within drip line
- Allow traffic, vehicles or equipment to compact the soil within the drip line
- Cut major tree roots

Specifically the Contractor shall:

- Tunnel under or around roots by hand digging so as to minimize damage to them
- Prune interfering branches and treat with a suitable dressing
- Treat any damaged roots over 1 inch in diameter, immediately, with a suitable tree paint

Existing vegetation within the right of way

Wherever possible the Contractor shall seek to retain as much existing vegetation within the right of way. Where vegetation is to be retained by the Contractor the health of the vegetation shall be ensured. This shall be aided by:

- Erecting site fencing around drip line of trees within the working area
- Not stockpiling material within drip line
- Not allowing traffic, vehicles or equipment to compact the soil within the drip line
- Not cutting major tree roots
- Tunnelling under or around roots by hand digging so as to minimize damage to them
- Pruning interfering branches and treat with a suitable dressing
- Treating any damaged roots over 1 inch in diameter, immediately, with suitable tree paint

When raising grades in the vicinity of vegetation to be retained, the following provisions shall be followed:

- When fill is less than 18 inches deep, place clean washed gravel approximately 2 inches in size around tree trunk to a minimum radius of 18 inches
- Place gravel before earth fill
- Do not leave earth in contact with trunks

When lowering grades in the vicinity of vegetation to be retained, the following provisions shall be followed:

- Provide broad rounded mounds for trees to be preserved and located above finished grade
- Minimize the amount of cutting within the drip line. This may involve leaving irregularly shaped mounds.
- Cut all exposed or broken roots greater than 1 inch diameter clean, treat with a suitable dressing and cover with topsoil.

Pesticides

Any pesticides used shall comply with any relevant legislation and requirements of the Ministry of Agriculture and Fisheries.

Support for trees

The Contractor shall ensure that trees and shrubs shall be planted and remain in an upright position at all times.

Mulch for Planting

Planting areas with Type D, E, F and M shall be mulched with a suitable material to an adequate depth to suppress weed growth. A minimum depth of 4 inches is required.

Stripping and storing of topsoil or material suitable for plant growth

All topsoil, or material identified as being suitable for plant growth, shall be removed and stored in such a way as to avoid damage to it's texture and structure or contamination from other materials or substances. The Employer will retain ownership of any stockpiled topsoil material the Contractor excavates from within the limits of construction, which the Contractor does not use in topsoil construction and which is suitable for use in topsoil construction.

Subsoil Preparation

All planting areas and seeded areas shall be loosened to a minimum depth of 4 inches prior to spreading topsoil, seeding and digging planting pits.

Imported topsoil / soil based products/ soil supplements

Material used by the Contractor as topsoil shall:

- have an organic content (after mixing, if supplement is used) of at least 1.0% (as determined in accordance with AASHTO T 194) and a pH value of between 5.0 and 8.0 (as determined with ASTM E 70).
- shall be free from appreciable quantities of hard clods, stiff clay, hardpan, gravel , large roots, refuse, large stones, and of reasonably uniform quality.
- shall be able to support the intended vegetation in terms of nutrition, moisture retention and aeration requirements.

If material is being imported from outside the island it shall be free of all pests and diseases and comply with any relevant legislation.

Landscaping Sand

Sand shall be obtained from a legitimate source in the Bahamas.

Topsoil depths

Depths of topsoil shall be sufficient for the long-term survival and flourishing of the intended vegetation. The minimum topsoil depths required are given under the Vegetation Types below.

Planting bed and hydroseeding area preparation

Areas to be seeded, shall be prepared in such a way as to ensure germination and growth of grass seed. All planting areas to be prepared in such a way as to ensure healthy growth and establishment. All trees and shrubs shall be pit planted. Planting pits shall be bigger than the rootball of the tree or shrubs for which it is intended. The sides and bottom of the planting pit shall be loosened to ensure future root growth of the plant is not hindered by compaction.

Plant material in general

Plant material shall be, healthy and free of all pests and diseases, in particular Lethal Yellowing Disease. Plant roots and aerial shoots/branches/foliage shall be undamaged and of the correct form and growth

pattern for their species.

All seed shall be fresh (i.e. harvested from the previous years crop), and free of vermin.

All plants and seeds shall meet the requirements of the Ministry of Agriculture and Fisheries and all applicable laws.

Planting Season and Time

Planting and hydroseeding shall be undertaken at an appropriate time of the year to ensure healthy growth and establishment of the plant material and the germination of seed.

2.0 Vegetation Types

Type A - Grass cover.

Species to be Pensacola Bahia *(Paspalum notatum)* or any other commonly occurring grass seed used on the island, excluding Soygia. Density of seed and method of application used shall be sufficient to ensure thick grass sward is established with no bare patches.

Topsoil
Topsoil is not specified for grass areas. Grass areas may be established by hydroseeding, which shall include mulch, water, fertilizer and binders.

Type B - Retention of existing vegetation

Type C - Vegetation cover at the base of rock-cuts

Rock-cut base

- Shrub planting at 3 ft centres in a single staggered row at base of rock-cut.
- Species to be Sea grape *Coccoloba uvifera*
- Plant nursery stock to be 1 gallon containers

Topsoil depth
The minimum topsoil depth in the vicinity of the root ball for rock cut base planting shall be 4 inches.

Type D — Native forest planting

Native forest planting mix shall comprise 40% tree mix and 60% shrub mix.

The Contractor's attention is drawn to the fact that the species for this mix may not be readily available at short notice from plant nurseries. It may therefore be necessary to arrange for stock to be grown on, in which case, a plant nursery may require 12 months or more prior notice.

Tree mix

Only the species listed in Table 1 below shall be used to form the tree mix component of the forest planting mix. At least 15 species must be chosen, and no species must form more than 20% of the mix. Species marked with an asterisk ie. * shall each form not less than 2% of the composition.

Table 1: Native Forest Planting — Tree Mix

Common name	***Latin name***
Mahogany *	*Swietenia mahagoni*
Gum elemi	*Bursera simaruba*
Broad leaf blolly/ Beefwood *	*Guapira obtusa*
Willow Bustic	*Sideroxylon salicifolia*
Paradise Tree	*Simarouba glauca*
Bastard Pigeon plum	*Coccoloba swatzii*
Pigeon plum *	*Coccoloba diversifolia*
Boar pigeon plum	*Coccoloba krugii*
Bahamas pigeon plum	*Coccoloba tenufolia*
Darling plum	*Reynosia septentrionalis*
Five finger	*Tabebuia bahamensis*
Pigeon berry	*Erythroxylum areolatum*
Lancewood	*Nectandra coriacea*
Cinnecord	*Acacia choriophylla*
Iron wood	*Eugenia rhombea*
Crabwood	*Ateramnus lucidus*
Cassada wood	*Bumelia salicifolia*
Milk-berry	*Bumelia americana*

Strong back	*Bourreria ovata*
Guiana plum	*Drypetes lateriflora*
Velvet seed	*Guettardia scabra*
Spanish stopper	*Eugenia foetida*
Mastic	*Mastichodendron foetidissimum*
Whitewood	*Drypetes diversifolia*
Dogwood	*Piscidia piscipula*
Red stopper	*Eugenia confusum*
Pitch apple /wild mamee *	*Clusia rosea*
Lignum vitae *	*Guaiacum sanctum*
Lignum vitae	*Guaiacum officionale*
Jamaica Cherry-fig	*Ficus perforata*
Short leaf fig	*Ficus citrifolia*
Ink wood	*Exothea paniculata*
Horse flesh*	*Lysiloma sabicu*
Prince wood	*Exostema caribaeum*
Long leaf blolly	*Guapira discolor*
Wild tamarind	*Lysiloma latisiliquum*
Hog cabbage palm	*Pseudophoenix sargentii*
Featherbed	*Diospyros crassenevis*
Red Ceder	*Juniperus barbadensis var. Lucayana*
Yellow wood	*Zanthoxylum cubense*

Shrub mix

Only the species listed in the table below shall be used to form the shrub mix component of the forest planting mix. All the species must be represented in the mix. No species shall form more than 20% of the

mix. Minimum percentages for certain species are given in Table 2.

Table 2: Native Forest Planting — Shrub Mix

Common name	***Latin name***
Coco plum	*Chrysobalanus icaco*
Buttonwood	*Conocarpus erectus*
Bahamas buttercup	*Turnera ulmifolia*
Bay Lily	*Hymenocallis arenicola*
Stinking pea root	*Ateleia gummifera*
Steelwood	*Randia aculeata*
Snowberry	*Chicocca alba*
At least 5% Saffron	*Chrysophyllum oliviforrne*
At least 5% Marlberry/marbleberry	*Ardisia escallonoides*
At least 10 % Hairy wild coffee or wild coffee	*Psychotria pubescens or Psychotria nervosa*
Poison cherry	*Crossopetalum rhacoma*
Rough Leaf Velvet seed	*Guettarda scabra*
Ram's horn	*Pithecellobium guadelupense*
Duranta/Golden dew drop	*Duranta repens*
At least 10% Poison wood	*Metopium toxiferum*

Planting density

- Plants to be planted in rows at 9 feet (3 yard) centres. Rows to be 3 yards apart. Successive rows to be offset to create a zig zag pattern between any two rows.
- Trees and shrubs to be thoroughly mixed and evenly spread throughout the planting area.
- No more than 5 plants of any one tree species to be planted adjacent to each other. Single species groups of shrubs to be limited to a maximum of 20 plants in any group.

Plant stock type

Trees to be in 3 gallon containers (minimum height of plant to be 3 feet). Shrubs to be in 1 gallon containers (minimum height of plant to be 1 ft).

Topsoil depths
The minimum topsoil depth in the vicinity of the root ball for this vegetation type shall be 6 inches.

Type E — Median vegetation

Road median vegetation shall comprise palms and low shrub/ground cover planting. Low shrub/ ground cover to be planted over the full width of the median to the lengths specified in the schedules. The design of the layout and species mixes of the ground cover or low shrubs shall be visually interesting and attractive.

Planting density
Palms to be planted at 30' centres in single rows in the centre of the median, with local design to suit utilities. Low shrubs/ground cover plants to be planted at 36 inch centres (1 per sq yd).

Palms species
Palm species to be native. Native palm species are given in Table 3 below. Palms susceptible to Lethal Yellowing Disease, such as Manila (or Christmas) palm *Veitchia tnerrilii* shall not be used.

Table 3: Median Vegetation – Palms

Common name	***Latin name***
Hog cabbage palm	*Pseudophoenix sargentii*
Thatch Palm	*Thrinax radiata*
Pond top palm	*Sabal palmettp*
Buffalo top palm	*Thrinax morrisii*
Silver top palm	*Coccothrinax argentata*

Low shrub/ground cover species
The Contractor may use any native or ornamental ground cover or low shrub or perennial species provided that the mature height of the species is less than 2 ft. Suggested species are given in Table 4 below:

Table 4: Median Vegetation — Low Shrubs/Ground Cover

Common name	***Latin name***
Bay Lily	*Hymenocallis arenicola*
Sea Oat	*Uniola paniculata*
Bahama Buttercup	*Turnera ulmifolia*

Purple Bletia Orchid	*Bletia purpurea*
Coco plum	*Chrysobalanus icaco*
Silver buttonwood	*Conocarpus erectus*
Sea Grape	*Coccoloba uvifera*
Native Scaevola	*Scaevola plumeri*
Wild Guava	*Tetrazygia bicolor*
Rong Bush	*Wedelia bahamensis*
Sea Purslane	*Sesuvium potulacastrum*

Plant stock type
Palms to be at least 3 ft of grey wood. Ground cover/low shrubs/ perennials to be in 1 gallon containers

Topsoil depths
The minimum topsoil depth is 4 inches over the whole of the planting area. For palms the minimum topsoil depth shall be 6 inches in the vicinity of the palm root ball.

Type F — Low vegetation

Low ornamental vegetation will comprise low shrub/ground cover planting.

Planting density
Low shrubs/ground cover plants shall be planted at 36 inch centres (1 per sq yd) in a staggered arrangement. Single species groups will contain a maximum of 40 plants.

Low shrub/ground cover species
The Contractor may use any native or ornamental ground cover or low shrub or perennial species provided that the mature height of the species is less than 2 ft. Suggested species are given in Table 5 below:

Table 5: Low Vegetation

Common name	***Latin name***
Bay Lily	*Hymenocallis arenicola*
Sea Oat	*Uniola paniculata*
Bahama Buttercup	*Turnera ulmifolia*
Purple Bletia Orchid	*Bletia purpurea*

Coco plum	*Chrysobalanus icaco*
Silver buttonwood	*Conocarpus erectus*
Sea Grape	*Coccoloba uvifera*
Native Scaevola	*Scaevola plumeri*
Wild Guava	*Tetrazygia bicolor*
Rong Bush	*Wedelia bahamensis*
Sea Purslane	*Sesuvium portulacastrum*

Plant stock type
Ground cover/low shrubs/ perennials to be in 1 gallon containers.

Topsoil depths
The minimum topsoil depth in the vicinity of the root ball for this vegetation type shall be 4 inches.

Type G — Screening vegetation

Screening vegetation will comprise an area of tree and shrub planting with a minimum width of 15 feet (5 yards).

Planting density

- Shrubs shall be planted at 25 inch centres (2 per sq yd).
- Trees to be at 30 ft centres. No more than 3 trees of the same species to be planted adjacent to each other.

Tree species
Only the species listed in Table 6 below shall be used. At least 5 species shall be chosen.

Table 6: Screening Vegetation

Common name	***Latin name***
Broad leaf blolly / Beefwood	*Guapira obtusa*
Satin Leaf	*Chrysophyllum oliviforme*
Horse flesh	*Lysiloma sabicu*
Pitch apple/wild mamee	*Clusia rosea*
Wild tamarind	*Lysiloma latsiliquum*

Bull wood	*Pera bumeliifolia*
Mahogany	*Swietenia mahagoni*
Five FInger	*Tabebuia bahamensis*
Dogwood	*Piscidia piscipula*
Gum elemi	*Bursera simaruba*

Shrub species
Any suitable native shrub species that grows to at least 6 ft high.

Plant nursery stock
Trees to be 6-8ft high with a minimum 2 inch calliper trunk. Shrubs to be 3 gallons containers (at least 2 ft high)

Topsoil depths
The minimum topsoil depth for this vegetation type shall be 6 inches in the vicinity of the root ball.

Type H - Tree clumps

Trees to be planted in clumps of 3 — 9 number. Spacing within clumps to be variable, between 18- 24 feet (6-12 feet for palms). Spacing between clumps to be variable, between 30-150 feet. No more than 5 trees of the same species and 10 palms of the same species shall be planted in any one clump. Each clump species composition to be different to that adjacent.

Tree/palm species
The Contractor shall only use species given in the tables below. The Contractor shall choose species suitable for the soil conditions where the clumps will be located.

Table 7: Tree Clumps — Tree / Palm Species

Common name	***Latin name***
Buttonwood (suitable for areas prone to water logging/wetness)	*Conocarpus erectus*
Cocoplum (suitable for areas prone to water logging/wetness)	*Chrysobalanus icaco*
Broad leaf blolly / Beefwood	*Guapira obtusa*
Satin Leaf	*Chrysophyllum oliviforme*
Horse flesh	*Lysiloma sabicu*

Pitch apple/wild mamee	*Clusia rosea*
Wild tamarind	*Lysiloma latsiliquum*
Bull wood	*Pera bumeliifolia*
Mahogany	*Swietenia mahagoni*
Five Finger	*Tabebuia bahamensis*
Gum elemi	*Bursera simaruba*
Any native tree to the Bahamas	
Palms	
Pond top palm	*Sabal palmetto*
Buffalo top palm	*Thrinax morrisii*
Silver top palm	*Coccothrinax argentata*

Plant nursery stock
Trees to be 6 - 8 feet high with a minimum of 2 inch calliper trunk. Palms to have a minimum of 3 ft of grey wood

Topsoil depths
The minimum topsoil depth for this vegetation type shall be 6 inches in the vicinity of the root ball of each tree/palm.

Type I — Avenue planting

Trees to be planted at 30 feet spacing in a single line at least 12 feet back from the edge of the highway.

Tree species
The Contractor shall only use the species listed in Table 8 below shall be used. Only one species to be chosen for each avenue. A minimum of four different types shall be planted throughout the scheme.

Table 8: Avenue Planting — Tree Species

Common name	***Latin name***
Broad leaf blolly / Beefwood	*Guapira obtuse*
Satin Leaf	*Chrysophyllum oliviforme*

Horse flesh	*Lysiloma sabicu*
Pitch apple/wild mamee	*Clusia rosea*
Wild tamarind	*Lysiloma latsiliquum*
Bull wood	*Pera bumeliifolia*
Mahogany	*Swietenia mahagoni*
Five Finger	*Tabebuia bahamensis*
Dogwood	*Piscidia piscipula*
Gum elemi	*Bursera simaruba*

Plant nursery stock
Trees to be 6-8ft high with a minimum 2 inch calliper trunk

Topsoil depths
The minimum topsoil depth for this vegetation type shall be 6 inches in the vicinity of the root ball of each tree/palm.

Type J — Transplanting of existing palms and trees

The Contractor shall transplant the existing palms and trees indicated in the schedules using a method that will ensure the long term survival of the plant. A suggested method is given below.

- 8 weeks prior to moving excavate a trench around the tree at a distance of 2 feet from the trunk.
- Trench to be minimum 12 inches wide and minimum 12 inches deep.
- Refill trench with loose excavated material
- Leave for 6 — 8 weeks
- Dig pit large enough to receive transplanted tree and loosen sides and bottom of pit
- Lift tree
- Transplant to same depth as it was growing to previously
- Backfill with fertilizer incorporated
- Water
- Support if necessary

Topsoil depths
The minimum topsoil depth for this vegetation type shall be 6 inches in the vicinity of the root ball of each tree/palm.

Type K — Roundabout trees

The Contractor shall only plant tree and palms species chosen from the table below on roundabouts and their quadrants. Palm species to be native. Native palm species are given in the table below.
Palms susceptible to Lethal Yellowing Disease, such as Manila (or Christmas) palm *Veitchia merrilii* shall not be used.

Table 9: Roundabout Trees

Common name	***Latin name***
Broad leaf blolly / Beefwood	*Guapira obtusa*
Satin Leaf	*Chrysophyllum oliviforme*
Horse flesh	*Lysiloma sabicu*
Pitch apple/wild mamee	*Clusia rosea*
Wild tamarind	*Lysiloma latsiliquum*
Bull wood	*Pera bumeliifolia*
Mahogany	*Swietenia mahagoni*
Five Finger	*Tabebuia bahamensis*
Dogwood	*Piscidia piscipula* .
Gum elemi	*Bursera simaruba*
Palms	
Hog cabbage palm	*Pseudophoenix sargentii*
Thatch Palm	*Thrinax radiata*
Pond top palm	*Sabal palmettp*
Buffalo top palm	*Thrinax morrisii*
Silver top palm	*Coccothrinax argentata*

Topsoil depths

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The minimum topsoil depth for this vegetation type shall be 6 inches in the vicinity of the root bail of each tree/palm.

Type L — Mangrove vegetation

The Contractors attention is drawn to the fact that mangrove vegetation is generally not be readily available from nurseries owing to its dependence on water and therefore an advance order is normally necessary.

Planting density

Mangrove plants shall be planted at the waters edge in clumps of 5 — 10 number. Clumps to be 15 feet apart maximum.

Species

Table 10: Mangrove Vegetation

Common name	***Latin name***
Saw Grass	*Cladium jamaicense*
Leather Fern	*Acrostichum aureum*
Pond Apple	*Annona glabra*
White mangrove	*Laguncularia racemosa*
Red mangrove	*Rhizophora mangle*

Plant Nursery Stock
1 gallon or other agreed with the Employer

Topsoil depths
none specified

M — Native vegetation for wetter/swampy areas

The Contractor shall design the layout and species mixes for areas requiring vegetation Type M to provide an area of natural appearing vegetation suitable for the site conditions.

Planting density
3 yd (9 feet centres) in staggered rows mangroves in the swamp areas

Species
The Contractor may use any native species suitable for the soil conditions. Suggested species are given in the table below.

Table 11: Native Vegetation for Wetter / Swamp Areas

Common name	***Latin name***
Buttonwood	*Conocarpus erectus*
Cocoplum	*Chrysobalanus icaco*
Saw Grass	*Cladium jamaicense*
Leather Fern	*Acrostichum aureum*
Pond Apple	*Anona glabora*
White mangrove	*Laguncutaria racemosa*
Red mangrove	*Rhizophora mangle*

Plant nursery stock

- Mangrove to be 1 gallon containers (or other in agreement with the Employer's Representative)
- Trees and shrubs to be in 3 gallons containers (minimum of height of plant to be 3 feet)

N — Native vegetation for developed areas

The Contractor shall design the layout and species mixes for areas requiring vegetation Type N to provide an area of natural appearing vegetation suitable for the site conditions.

Planting density

- Plants to be planted in rows at 9 feet (3 yard) centres. Rows to be 3 yards apart. Successive rows to be offset to create a zig zag pattern between any two rows.
- Trees and shrubs to be thoroughly mixed and evenly spread throughout the planting area.
- No more than 5 plants of any one tree species to be planted adjacent to each other. Single species groups of shrubs to be limited to a maximum of 20 plants in any group.

Species

The Contractor may use any native species suitable for the soil conditions. Suggested species are given in the table below.

Table 12: Native Vegetation for Developed Areas - Trees

Common name	***Latin name***
Mahogany *	*Swietenia mahagoni*

Gum elemi	*Bursera simaruba*
Paradise Tree	*Simarouba glauca*
Thatch Palm	*Thrinax radiata*
Five finger	*Tabebuia bahamensis*
Cinnecord	*Acacia choriophylla*
Willow bustic/cassada wood	*Bumelia salicifolia*
Strong back	*Bourreria ovata*
Lignum vitae *	*Guaiacum sanctum*
Wild tamarind	*Lysiloma latisiliquum*
Hog cabbage palm	*Pseudophoenix sargentii*
Satin Leaf	*Chrysophyllum oliviforme*

Table 13: Native Vegetation for Developed Areas— Shrub Mix

Common name	***Latin name***
Coco plum	*Chrysobalanus icaco*
Buttonwood	*Conocarpus erectus*
Bahamas buttercup	*Turnera ulmifolia*
Bay Lily	*Hymenocallis arenicola*
Wild coffee	*Psychotria nervosa*
Rams horn	*Pithecellobium guadelupense*

Plant stock type

Trees to be in 3 gallon containers (minimum height of plant to be 3 feet). Shrubs to be in 1 gallon containers (minimum height of plant to be 1 ft).

Topsoil depths

The minimum topsoil depth in the vicinity of the root ball for this vegetation type shall be 6 inches.

3.0 Maintenance

The Contractor shall maintain all planted or seeded areas to the end of the contract period. The Contractor shall visit each landscape area not less than every three months to ensure:

- the health of the plants is maintained
- the tidiness of the planting areas is maintained
- planting areas are maintained 95 % free of weed growth
- all dead or dying plants or areas of poor grass growth are replaced or re seeded.
- the depth of the mulch is maintained
- the plants are maintained in an upright position
- height of grass to be no more than 3 inches at any time
- Any re-growth of invasive species removed