**METHODOLOGY**

The proposed levee is to be constructed at site 2, near the existing flap gate toward the EFL Depot. The length of the levee to be constructed is approx. 70m (approx. from chainage 1460 to Chainage 1390). The actual two end points of the levee are to be determined on site.

Upon successful construction of the levee, the contractor in collaboration with the Ministry of Waterways in Labasa, need to ensure the flap gate is intact and function well prior removing the existing cofferdam toward seaside of the existing flap gate. Please refer to Item 6 of the BoQ for details.

1. **CONSTRUCTION SEQUENCE OF THE LEVEE**
2. The contractor must ascertain all dimension and location of the levee prior to construction.
3. Ensure that the existing coffer dam toward the river side at site 2 is intact before the construction of the levee.
4. Filling materials for construction of levee shall be approved prior transporting to construction site.
5. Due to urgent nature of work, fill volume may be determined by truck tray volume rather than by survey. Material loaded on truck trays will have to be levelled flat for determination of volume by Engineer's field staff. This applies to both red clay and 25-50mm river gravel.
6. Laying and filling of red clay shall be spread and compacted in every layer of 150mm thick to finish crest level.
7. Compaction shall be done by appropriate compactor equipment or ‘Sheep foot roller’ as per approved by Engineer.
8. Side Slope shall be 1.5:1 (H:V) on both sides of the levee.
9. Place a geotextile/grid on top of the consolidated red clay fill.
10. Place on surface gravel shall be washed river gravel (25mm-50mm dia.) and as per drawing and approved by Engineer. Sample shall be approved first prior to delivery to construction site.
11. Bulk bags are to be placed on top of the geofabric at both toes of the levee, and normal sandbags be placed on top of the geofabric at both slopes of the levee as per drawings. This will provide added strength to slope
12. **CONSTRUCTION OF THE LEVEE IN DETAILED**

The construction of levee should strictly oblige to adhere the quality and technical workmanship as specified in the contract and international technical procedure and standard. The procedure of compaction shall follow strictly as specified to produce a soil mass uniformly compacted to not less than 95% of the maximum dry density when tested in accordance with AS 1289.

Construction of levee shall include all procedures in technical term and as specified. All unnecessary existing materials, rubbish, plants, trees, shrubs, mangrove, etc. shall be removed prior of levee construction and as per approved by the Engineer to start filling/ construction works.

Contractor shall first remove the base surface of the unwanted soil approx. 200mm thick or more and any obstructed unnecessary materials along the proposed levee alignment. The surface shall be cleared, grade and compact and established the sub-base prior of clay soil. Levee shall be constructed to the lines, grades and dimensions as shown on the drawings or as established by the Engineer. Every thickness of the soil fill layers shall not exceed 150mm after compaction. The moisture content of the materials at the start of compaction shall be at or near the optimum moisture as determined by the standard laboratory compaction test on soil.

At least twice field compaction test shall be undertaken as per Engineer’s decision at the Contractor’s cost for those testing.

Construction of levee shall be filled with approved red clay and shall have four (4) meters width on top finished crest level (1.90meters above mean sea level through out of Levee). Contractor shall follow as stipulated in contract Section 3 – (Earthworks) and Section 5 (Construction of Levee). Contractor shall provide the sample and source of earth fill materials to be approved by the Engineer “prior of construction” for laboratory test. In the failure of soil test result, the contractor must find another suitable source of soil fill to get the satisfactory result.

**Compaction Equipment**

Compaction of levee to be done by the use of sheep foot roller, pneumatic rollers, vibratory compactors or other type of compaction equipment at the Contractor’s option as approved by the Engineer. The Engineer shall have the right to require the contractor to change compaction equipment if such equipment is deemed unsuitable in achieving the specified degree of compaction within a reasonable period of time.

**Surface Gravelling to Levee**

Approved river gravel materials (25mmØ - 50mmØ in gravel size) shall be dumped on the prepared graded surface of levee crest and spread in layers with a thickness of 150mm and compact by “four passes” of vibratory compactor. The contractor has the option to adopt any method of compacting the layers of gravel surface approved by the Engineer.

Gravel surfacing will be measured by the cubic meter of materials acceptable place and compacted based on the net lines and existing dimension.

The volume measured as provided above will be paid at the unit contract price per cubic meter, which price and payment shall constitute full compensation for furnishing all materials, suppliers, labour, tools, equipments and all incidentals or subsidy works necessary for the successful completion of the work.

#### MATERIALS SPECIFICATION

**Hardcore**

1. Hardcore shall consist of clean, hard, durable material, either broken stone, bricks or concrete, graded from 20 mm to 50 mm and be free from extraneous matter.

**Permeable Structural Membrane (Filter Cloth) – Geotextile/Grid**

1. Permeable structural membrane shall be thermally bonded non-woven material. It shall have a chemical composition of 70% polypropylene and 30% polyethylene, with a minimum thickness of 0.7mm and a nominal weight of 140g/m2.

2. The membranes shall be wrapped in black polythene until required for use.

**Fill Material – (Material Type B)**

 1. Filling material Type B shall consist of uniform, readily compactable material, free from vegetable matter and building rubbish and having a Liquid Limited between 60% and 85% and a Plasticity Index between 25 and 65 when tested in accordance with AS 1289. Clay lumps and stones shall be retained on 75mm and 37.5mm sieves respectively and between 40% and 70% of the material shall pass a 200mm standard sieve.

**Gravel Pavement Material – (Material Type C)**

1. Gravel pavement material Type C shall consist of hard durable, well-graded natural gravel or crushed rock free from organic or soluble material and suitable for compaction to form a dense stable pavement.

2. The grading curve of Type C material shall lie within the following limits when tested in accordance with AS 1289 and its shape shall resemble the shape of the upper and lower limit curve

 **Sieve Size** **Percentage Passing**

 (by weight)

. 75 mm 100

 37.5 mm 55 - 85

 19 mm 40 - 70

 9.5 mm 30 - 60

 4.75mm 25 - 40

 2.36mm 20 - 40

 600 um 12 - 30

 300 um 8 - 10

 75 um 3 - 10

3. The Liquid Limit and Plastic Limit of the fine fraction of the material shall not be greater than 30% nor less than 7% respectively when tested in accordance with AS 1289.